the OIL AND GAS JOURNAL
PUBLISHED WEEKLY OCTOBER 17, 1960

If the "cold" war stays cold–

We're over the hump in military demand

Outlook through fiscal 1964 shows little change in military needs in this EXCLUSIVE JOURNAL INTERVIEW with top military planners p.62

Completions may top 45,000 this year ▸ 59

Computer helps run biggest crude unit ▸ 66

Japanese company maps big growth ▸ 80

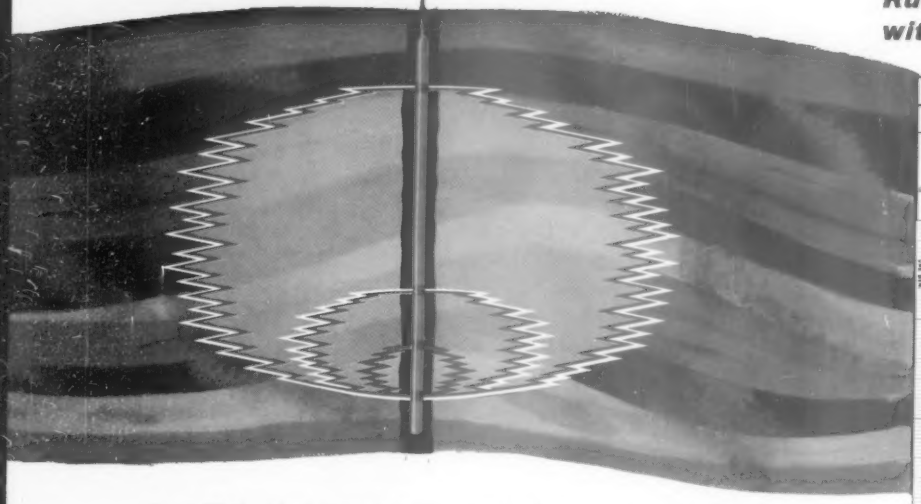
How Gulf set a new drilling record ▸ 92

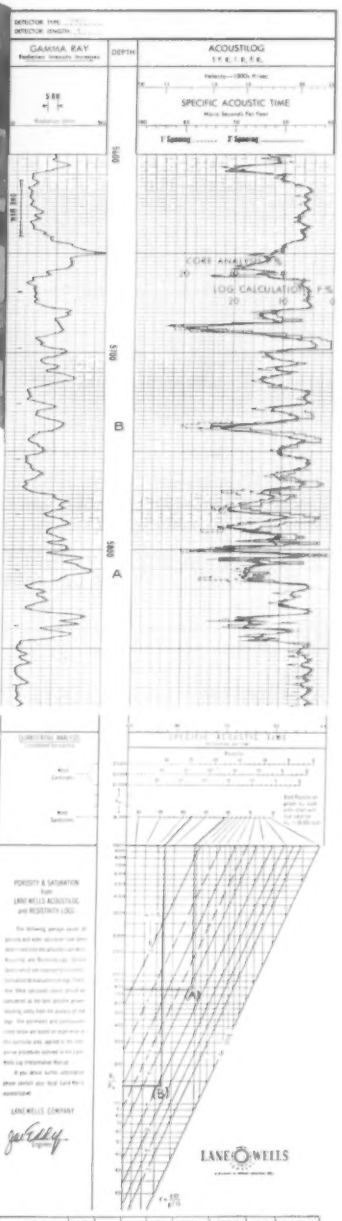
How Transwestern line was built ▸ 100

Another FIRST by LANE-WELLS

DUAL SPACED ACOUSTILOG*

Run SIMULTANEOUSLY with Gamma Ray or SP





Lane-Wells Dual Spaced Acoustilog is the most accurate, most meaningful, most informative, quickest run log of this type available anywhere. All new instruments, offered exclusively by Lane-Wells, make it possible to run both 1′ and 3′ spacing curves plus either a self potential or a gamma ray curve all on one trip into the well.

Provides Most Meaningful, Most Accurate FORMATION EVALUATION

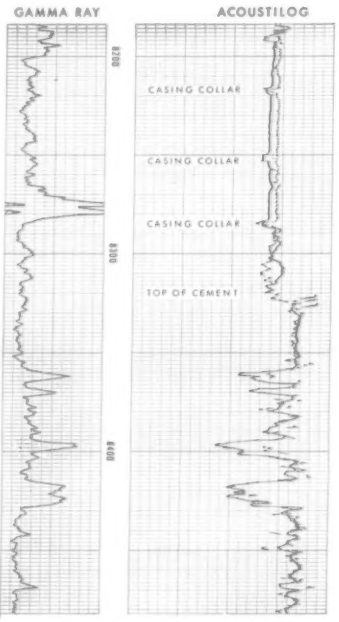
MOST MEANINGFUL!—Because both the 1′ and 3′ curves are recorded while the instrument is in the same position in the borehole, the differences in readings are significant and reliable. Porosities may be read accurately directly from the log. **MOST ACCURATE!** — Exclusive design and circuitry features of Lane-Wells Dual Spaced Acoustilog enable it to measure sound velocities within ±2% of known formation velocities.

PLUS – CEMENT LOCATION

Dual Spaced ACOUSTILOGS have proved remarkably valuable in locating cement and channeling behind casing. Even in areas where other cement locating equipment fails, Acoustilog gets the information.

For complete information about how the all new Dual Spaced Acoustilog can save you money and give you more information about your well, call your nearest Lane-Wells office or write P. O. Box 1407, Houston 1, Texas.

*Lane-Wells Service Mark



Acoustilog used to locate cement.

ZONE INTERVAL	NET PAY	ϕ_1	ϕ_2	S_w	AVERAGE POROSITY	AVERAGE WATER SAT.	POSS. PROD.	BBL. OIL PER ACRE-FOOT
A 5209'-5216'	7	27	.035	770	10.5%	32%	OIL	5960
B 5735'-5740'	5	5.0	.035	142	18%	93%	OIL	5960
to								
to								

LANE-WELLS CO.
HOUSTON, TEXAS
LOGGING · PERFORATING · PACKERS · BRIDGING PLUGS
DRESSER INDUSTRIES, INC.
OIL · GAS · CHEMICAL · ELECTRONIC · INDUSTRIAL

ONE OF THE DRESSER INDUSTRIES

You're AHEAD with
Lane-Wells' Superior Service

OIL AND GAS JOURNAL
Vol. 58, No. 42

Contents October 17, 1960

THE WEEK'S NEWS

General Interest:
Wyoming Supreme Court Rules Out School Tax ... 60
Supply Companies' Collection Troubles Are Getting Worse ... 60
Monterey Sale to Humble in Final Stages ... 61
Military Trims Estimate of Long-Range Fuel Demands ... 62
Military-Oil Industry Seminar Studies Mutual Problems ... 65
Phillips Petroleum's Gains Prove It Pays to Diversify ... 68
Fantastic Decade of Growth Forecast for Natural-Gas Industry ... 69
Russians Tardy, But Tour of U. S. Oil Facilities Is Under way ... 70
Higher Field Prices, Less Gas Regulation Predicted by Connole ... 70
FPC Defines Pricing Area Boundaries ... 73
Enco May Be Humble's National Brand ... 75
Oil's Insurance Programs Are Undergoing a New Scrutiny ... 76

Drilling-Production:
Year's Well Completions Should Reach Midyear Forecast Total ... 59
Shell Used Aluminum Drill Pipe on Texas Well ... 72
Gas Turbine Used for First Time on Fracturing Job ... 78

Processing:
Computer Control Spurs Efficiency of World's Largest Crude Unit ... 66
OCDM Begins Surveillance of Resid Sales ... 75
OCAW Threatens Strike at Gulf Coast Refineries ... 78

Foreign News:
Japan's Big Independent Plans to Double Everything ... 80
Chile Opens First Mainland Oil Production ... 82
New Refinery Will Tighten West German Market ... 83
Venezuela Takes Steps to Halt Crude Movement to Western Canada ... 83
International Oil Industry Eyes Second Arab Congress ... 84
Gradual Nationalization of Jersey's Peru Properties Approved ... 84

Pipelining:
Humble Would Be Key Supplier of Mexico-to-California Line ... 61
Pipeline Briefs ... 68

Exploration:
Wildcats Planned in Georgia, Alabama ... 70
Salt-Dome Knowledge Collected in Impressive New Volume ... 163
More Work May Turn Up New Oil in Kansas' Alma Anticline ... 164
September Multiple Completions ... 176

REGULAR FEATURES

Advertisers' Index ... 191
Calendar of Events ... 46
Classified Advertising 188
Drilling Contractors ... 159
Drilling Statistics ... 184
Editorial ... 55
Equipment Men ... 154
Exploration Highlights 163
Foreign News ... 80
Foreman's Page ... 123
Journally Speaking ... 53
Markets ... 187
New Equipment ... 139
On the Job—Pipelining 130
Personals ... 178
Production ... 185
Refinery Statistics ... 186
Statistical Summary ... 183
Technical Questions ... 126
The Journal Said ... 53
They Say ... 40
Trade Literature ... 149
Watching Washington 73
Who's Who in Oil ... 178

Technology-Operation section on next page →

The Oil and Gas Journal is published weekly by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-Class postage paid at Tulsa, Okla. Copyright 1960 by The Petroleum Publishing Co. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

TECHNOLOGY—OPERATION

Drilling-Production

New Plastic Pipe Passes Field and Lab Tests 89

By James C. Lehr and Robert B. Orr

Delrin acetal resin pipe makes new applications possible through improved properties not previously available to the petroleum industry. Pipe shows high strength while exposed to sour crude, a high resistance to fatigue, and a high impact strength.

How Gulf Set A New Drilling Record 92

By Carl Hoot

A step-by-step picture story showing a new oil-industry record in process of being set. The rig drilled to 10,000 ft. in 3 days, 20½ hours in Timbalier Bay, La. In the time necessary to ready this article for publication this record has been broken three times.

Oil-Well Pumping—19 115

By Joseph Zaba

Here are constants for design of sucker-rod strings.

Pipelining

How the New Transwestern Line Was Designed and Built 100

By Norman F. Blundell

The 2,000-mile-plus Transwestern pipeline system began initial deliveries of gas at the Arizona-California state line on August 9. Daily design capacity of the system is 300 M.M.c.f.d., with reserve built into the system to give 350 M.M.c.f.d., for peak-day demands. Ultimate design capacity of the single-line system is 640 M.M.c.f.d. Of the total 161,000 hp. to be installed on the line only 35,000 hp. has been installed. The line contains a number of unusual operating and communications features.

Gas Hydrates: A Practical Control Method—2 130

By L. E. Connealy

Injections of methanol are used by Texas Eastern Transmission Corp. to prevent the formation of gas hydrates. Methods have been refined so that both the frequency of occurrence and the cost of correction have been reduced appreciably.

Refining-Processing

New Plastic Pipe Passes Field and Lab Tests 89

By James C. Lehr and Robert B. Orr

Bimetallic Pipe May Cure Corrosion 112

Here is a way to take advantage of the special properties of alloys and at the same time avoid excessive expense: use a thin alloy lining inside carbon-steel pipe. Strip lining shows its greatest advantages when pressures are high, sizes are large or alloys are expensive.

Sulfur Recovery From Petroleum Gases 118

By Robert A. Graf

A summary of present status of this technique in the petroleum industry. While the total cost for manufacture of sulfur from byproduct H_2S varies with the size of the installation, it is in the range of 50% of the current price, for the larger units.

The Foreman's Page 123

Refinery Chemistry 5: Special benzene properties make aromatics an important branch of hydrocarbon family.

Questions on Technology 126

Fluorosis not found in alkylation-plant workmen.

How to Fight Pretreater Corrosion 127

By Kenneth W. Brooks

Corrosion and fouling in the exchanger train following reformer pretreater have been problems with refiners ever since hydrogen treating first came into use. Mobil's East St. Louis refinery experience shows that the use of intermittent water wash, inhibitors, and ammonia injection makes alloy exchanger tubes unnecessary.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Oct. 17, 1960

Key oil issues have drawn comments from the candidates:

Answering inquiries directed at them by the Oklahoma Independent Petroleum Association, the candidates line up like this:

...Nixon—flatly opposes cut in percentage depletion for oil and gas production, indicates no changes are contemplated in mandatory import-quota system.

...Kennedy—says any change in depletion policy must be based on a natural-resources study which he would order, indicates as long as import controls serve national security by maintaining a healthy oil industry he will retain them.

Views of Nixon and Kennedy were sought by OIPA to give them a chance to clear up any misunderstanding stemming from their voting records revealed in July by the Oil and Gas Journal.

Tidelands issue causes political rumblings in Texas.

Will Wilson, the Democratic state attorney general, is passing the word that a Kennedy administration "will honor" court decision giving Texas and Florida title to 3 leagues of submerged lands in the Gulf. The Republicans, he says, will try again to cut Texas back to 3 miles.

Different picture is painted by Allan Shivers, former Democratic governor now heading Texas Democrats for Nixon. He accuses Democratic party of a "determined, persistent, consuming desire to take tidelands away from us."

▼ ▼ ▼

The military is trimming its estimates of future need for petroleum products.

That's conclusion drawn from estimates of military oil use through 1964 just made by Defense Department (p. 62).* It does not mean that current military demand will drop—only that the anticipated increases in years ahead may not occur.

The trend: Estimates now call for 677,000 bbl. daily of all oil products for military by 1964. A year ago the estimate for 1964 was 725,000 bbl. daily.

---

*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

OCDM mailed new price-reporting forms last week to about 60 East Coast importers and distributors of residual fuel oil.

Some industry officials fear this is a step toward price controls. But OCDM, pointing out that it is required by the President to maintain price surveillance under the import plan, says it has found no alternative (p. 75).

U. S. Supreme Court has refused to rehear the offshore boundary case, thus leaving Congress as the last resort of Louisiana, Mississippi, and Alabama to get a 3-league instead of a 3-mile limit.

Louisiana, however, still hopes to get the Coast Guard line designated as its shore line. This would give the state most of the areas in disputed Zones 2 and 3, even under a 3-mile limit.

TIPRO, too, is urging Interior to cut imports. It says Texas oil producers are in serious distress.

Earlier IPAA had filed similar appeal with Interior. Neither group specified the amount of desired cut.

Gulf Oil Corp. will drop its court test of residual fuel-oil allocations.

Reason: Recent proposed changes in residual import rules would make much of the court suit moot. Furthermore, Gulf will get a much higher quota—perhaps 20,000 bbl. daily more—if the plan to base quotas on terminal input as well as historical imports is adopted.

▼ ▼ ▼

An electronic computer is increasing the efficiency of the world's largest refining unit, a 140,000-bbl. crude plant at Indiana Standard's Whiting refinery.

Every 4 minutes it reads 196 instruments on the unit and every 20 minutes types control orders derived from 75,000 stored instructions.

Final control adjustments are made manually by an operator but by next year the unit will be put on full closed-loop control. Then the computer also will make all the control adjustments too (p. 66).

Hydrocracking has taken another upward step with announcement that Ohio Standard will build a 7,500-bbl. Isocracking unit at its Toledo refinery.

This is the first license issued by California Research Corp., whose parent company, California Standard, has been operating a 1,000-bbl. daily Isocracker at Richmond for the past 18 months.

Sohio's announcement also follows decision by Powerine Oil Co. to install a 2,200-bbl. per day Lomax unit (OGJ, Sept. 19, p. 68).

Heavy oil may find a future market in iron making. Esso Research reports tests show heavy oil can be successfully injected into the bottom of blast furnaces to help speed the reduction of ore into pig iron. It helps increase furnace capacity and decrease costs of production.

California Standard is enjoying a great marketing year. Civilian sales are expected to average 11% higher than last year. Company gains in the retail gasoline market in the West are running double that of the industry. This gives California Standard its highest percentage of available market achieved in the last 10 years.

▼ ▼ ▼

Oil operators are above target on their revised 1960 drilling program and should easily drill the 45,000 wells predicted at midyear (p. 59).

The rundown:

...34,016 wells completed in first 3 quarters.

...11,435 wells to be drilled in last 13 weeks to reach 45,451 wells programed.

...Average of 800 wells per week needed in last quarter is far under the 900 wells per week averaged in the last 7 weeks.

First major discovery in Williston basin this year is Murphy 1 Sletvold in Roosevelt County, Montana. It flowed 87 bbl. of oil in an hour on test of Nisku Devonian pay at 7,664-80 ft. It lies 15 miles northwest of Poplar field, 35 miles southwest of Redstone field and 50 miles north of Southwest Richey and Duck Creek fields.

Big Abo reef strike is expected at Standard of Texas 2 Vacuum Edge unit in Lea County, New Mexico. This well has cut 488 ft. of Abo reef and oil was recovered on seven consecutive drill-stem tests. Oil has flowed up to 35 bbl. per hour on tests but operator is now drilling ahead below 8,800 ft. Location is 12 miles southwest of Lovington Abo field.

▼ ▼ ▼

Industry notes: Kenai gas won't move into Anchorage this winter—work has been halted until spring on Tournegain Arm crossing of new pipeline...Humble emerges as key supplier to proposed Texas-Mexico-California gas line...Second Arab Oil Congress opening this week in Beirut has one aim—increase share of oil revenue for the producing countries...Rush of job swapping has occurred this year among oil researchers. One company has hired eight top scientists this year—five of them from other oil labs.

Market Memo

Oct. 17, 1960

It's getting late in the season, and nothing has happened yet to move markets off dead center.

Sellers are finding it too late to move gasoline in any volume. Buyers find it too early to buy light fuels in volume. This lack of demand is a cloud over the product market.

Refiners hope for an early winter and for inter-refinery buying to hold current posted prices which in September were the highest for many months. This despite a 2.5% reduction in September demand compared to a year ago.

Refiners are reluctant to cut posted prices, however. They are helped in this decision by the crude market which is tight and firm at posted prices.

Gulf Coast product prices are static. Refiners are offering 92-RON gasoline at the 11.25 cents posted price and No. 2 at 8.25 cents.

There are at least eight T-2's of gasoline available for spot purchase, divided equally between independents and majors. This means gasoline stocks are becoming excessive.

Bunker C fuel is tight at its posted $2.30 per barrel—the one product in demand on the Gulf Coast.

Calls for purchase of spot products from river terminals are few and far between. Activity is so quiet that not enough deals are being made to develop a price trend.

Gasoline is not yet being offered at discounts sufficient to close deals on a spot basis. An occasional barge of kerosine or No. 2 finds a home at 9 cents and 8.25 cents respectively.

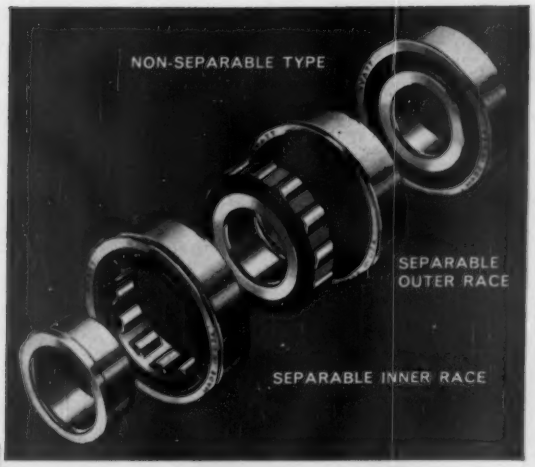
Gasoline demand in the Great Lakes pipeline area is good and discounts are negligible. Price for 91-RON gasoline is 12.25 cents on spot sales, shading off to 12 cents in northern end of the line.

Inter-refinery inquiries for No. 2 during last 2 weeks have not uncovered any price weakness. Although middle distillates are not moving, they are firm at 10 cents for No. 1 and 9 cents for No. 2.

Chicago markets are unchanged. Discounts of one-quarter to three-eighths cent per gallon on gasoline continue but not from enough sources to change posted price of 12.625 cents.

Posted prices are generally holding on No. 1 at 10.25 cents and No. 2 at 9.5 cents.

YOU GET FIVE IMPORTANT BENEFITS WHEN YOUR "SPECS" READ **HYATT**



RELIABILITY

Hyatt reliability is measured by results. For example, The Hyatt Reliability Program embraces every phase of product development. In procurement, it weeds out all but the highest-grade raw material. In engineering, Hyatt Reliability insures efficient, accurate design. In manufacturing, it provides careful inspection and rigid adherence to specifications. And Hyatt Reliability does not stop there. Hyatt sales engineers work with you to help recommend the best possible bearing for your requirements. Then, they follow up to make sure Hyatt bearings deliver in service. And no one knows more about cylindrical bearings. For over 68 years, Hyatt has produced top-quality bearings for almost every type of application. Check the benefits that are yours when your "specs" read Hyatt.

2

PRICE. Hyatt's advantages of quality, assembly practice and uniformity of product can often reduce over-all cost to you.

3

DELIVERY. Hyatt's unsurpassed production facilities deliver bearings in quantity with maximum speed and economy.

4

ENGINEERING. Hyatt's engineering is backed by the extensive research and engineering facilities of General Motors.

5

SERVICE. Hyatt Sales Engineers are trained bearings specialists who can save you man-hours and dollars.

HYATT *HY-ROLL BEARINGS*
FOR MODERN INDUSTRY

HYATT BEARINGS DIVISION, GENERAL MOTORS CORPORATION, HARRISON, N. J.

See anything unusual here?

Well—look closely! It's an "Oilwell" Century Pumping Unit, a Witte Gas-Gasoline Engine, a quality Polished Rod (as well as a bottom hole pump and sucker rods that you can't see). And what's more—it was all obtained from the nearby "Oilwell" store.

So, stop looking for something unusual in this familiar scene.

This is typical of the many 100% "Oilwell"-equipped wells where expertly engineered and precision built machinery is providing reliable service with a minimum of attention and expense.

Your "Oilwell" store has all this and more too—a capable and courteous crew willing to assist you in the selection of the proper equipment for any of your production needs.

USS and "Oilwell" are registered trademarks

This mark tells you a product is made of modern, dependable Steel.

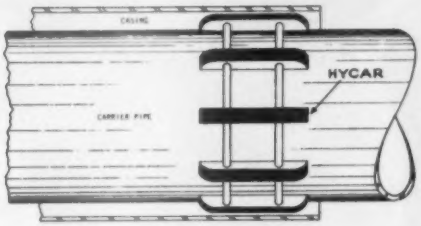
USS **Oil Well Supply Division of United States Steel**

Executive Offices: Dallas, Texas
Export Offices: 30 Rockefeller Plaza, New York 20, N. Y.

News about

B.F.Goodrich Chemical *raw materials*

Pipeline insulators get their strength and long life from Hycar



Pipeline insulators manufactured by T.D. Williamson, Inc., Tulsa, use hard blocks molded of Hycar by Fo-Mac Enterprises, Inc., Tulsa. B. F. Goodrich Chemical Company supplies the Hycar nitrile rubber.

These insulators for centering pipeline inside casings are made of Hycar nitrile rubber. Hycar gives the non-conducting properties needed to protect against leakage current that could create electrolytic corrosion, it also offers important strength and service factors.

For example, Hycar provides the high compression strength needed to withstand the pipeline or backfill. In addition, Hycar provides superior resistance to severe abrasion or tearing that might be created when pipe is inserted in casings. Hycar is tough. It isn't affected by chemicals or most causes of corrosion. It will retain its excellent properties over long periods of service.

Here's another example of the way that Hycar improves products, sometimes opening whole new markets. For more information, write Dept. FH-10, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar
Reg. U. S. Pat. Office
Rubber and Latex

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

O·C·T

PRESENTS
THE ULTIMATE IN
LOW PRESSURE TUBING HEAD
SIMPLICITY, FLEXIBILITY, ECONOMY

Here it is . . . a low pressure tubing head that combines three all-important factors—*simplicity*, *flexibility* and *economy*.

With this new unit you can use tubing stripper in combination with other equipment if desired, without the necessity for adding stripper housing or bowl.

Threaded tubing hangers are available for use with or without the stripper.

Ease of installation: It's a cinch!

Ruggedness? It's tough as a boot!

When you need a low pressure head, you can get the best from

O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Address Export Inquiries for All Countries to
P. O. Box 3091, Houston, Texas.

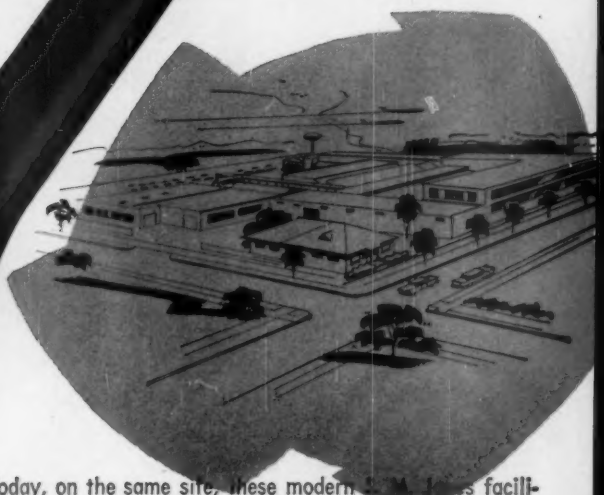
where progress is a daily practice

JONES

FIRST IN 1894...

S. M. Jones produced the first all-metal sucker rods in 1894 under the name of the Acme Sucker Rod Company in Toledo, Ohio...

FIRST TODAY...



Today, on the same site, these modern S. M. Jones facilities are devoted exclusively to designing and manufacturing the finest sucker rods in the world.

...because we're Sucker Rod Specialists!

There are four JONES JOB-ENGINEERED SUCKER RODS... a type for every pumping need!

THE S. M. JONES COMPANY

Division of Buffalo Eclipse Corporation

General Office and Factory: TOLEDO, OHIO

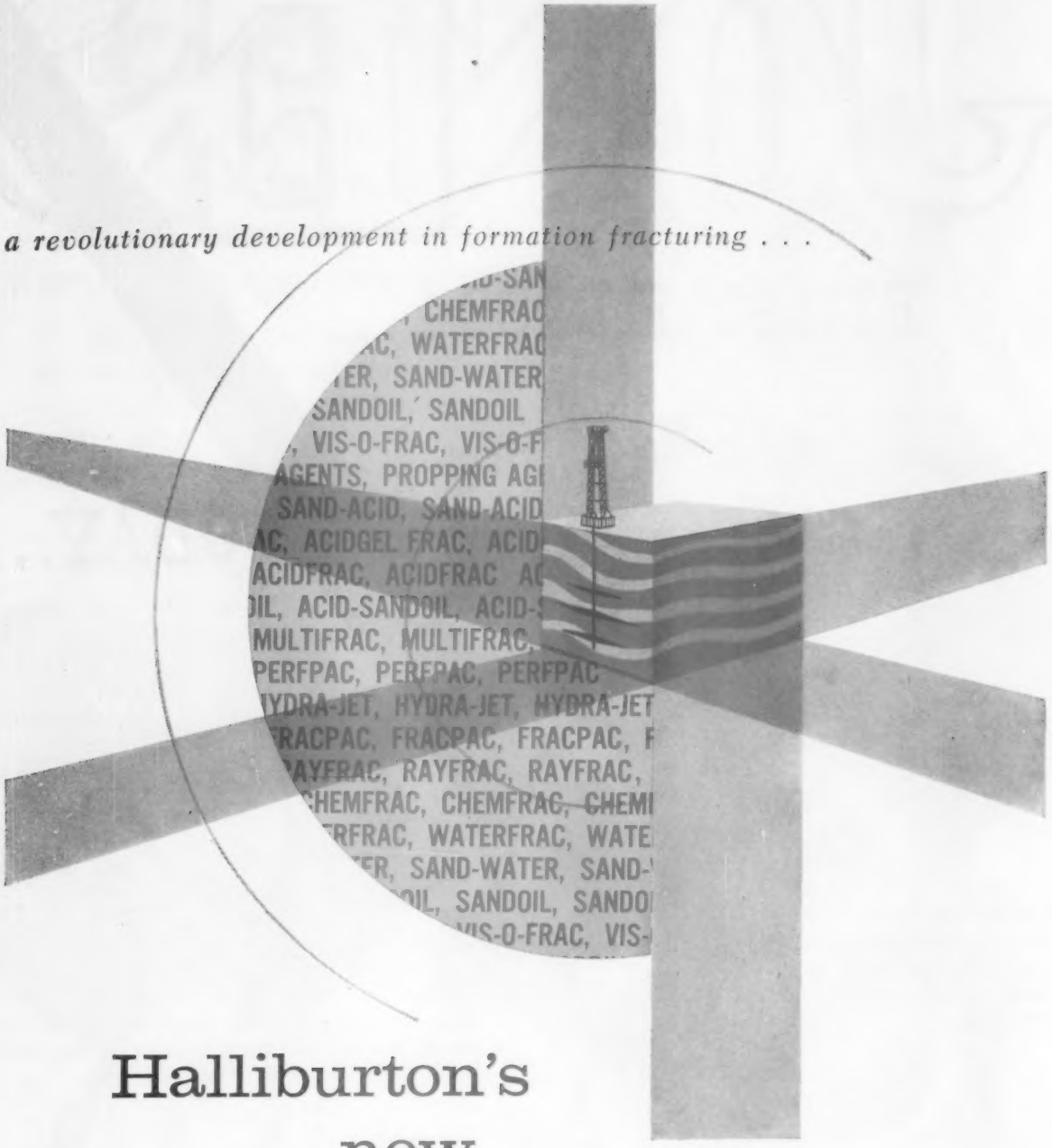
Sales Office: Enterprise Building, TULSA, OKLAHOMA

Export Sales Representatives:

IDECO, One of the Dresser Industries, Dallas—New York

Franklin Supply Company, Export Division, Inc., New York

a revolutionary development in formation fracturing . . .



Halliburton's new FRACPLAN

A working partner in your fracturing operation . . . the HALLIBURTON *FRACOMETER* . . . Ask about it!

WHAT IS FRACPLAN?

FRACPLAN is a new Halliburton method to help you design better fracturing programs. Through its use Halliburton can better assist you in selecting: • The proper fracturing fluid and treatment volume • The proper "pad volume" for conditioning fracture surfaces • The type and optimum amount of propping agent for high flow capacity • The proper propping agent-to-fluid ratio for more even distribution within the fracture.

This **FRACPLAN** Method is largely dependent upon specific laboratory evaluations of formation cores and fluids.

HOW WAS FRACPLAN DEVELOPED?

In 1959, Halliburton published a Technical Report describing a method of fracture treatment design. Information gained through the applied use of the theories, ideas and practices presented in this report, coupled with additional research and development by the petroleum industry . . . plus years of experience in formation fracturing have now been combined into this new approach to fracturing – **FRACPLAN!**

HOW IS FRACPLAN BETTER?

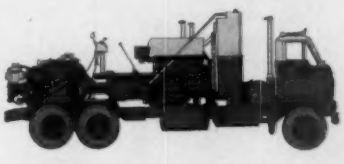
The original Halliburton Fracture Design answered a pressing need of the industry by setting up guideposts with which to program treatments.

FRACPLAN goes beyond this original concept. It gives more consideration to selection and placement of the propping particles to provide better fracture flow capacity for increased productivity.

HOW CAN YOU BENEFIT FROM FRACPLAN?

Your nearby Halliburton Fracturing Representative has the **FRACPLAN** details. Let him explain how it may improve your fracturing results!

FRACTURING SERVICES



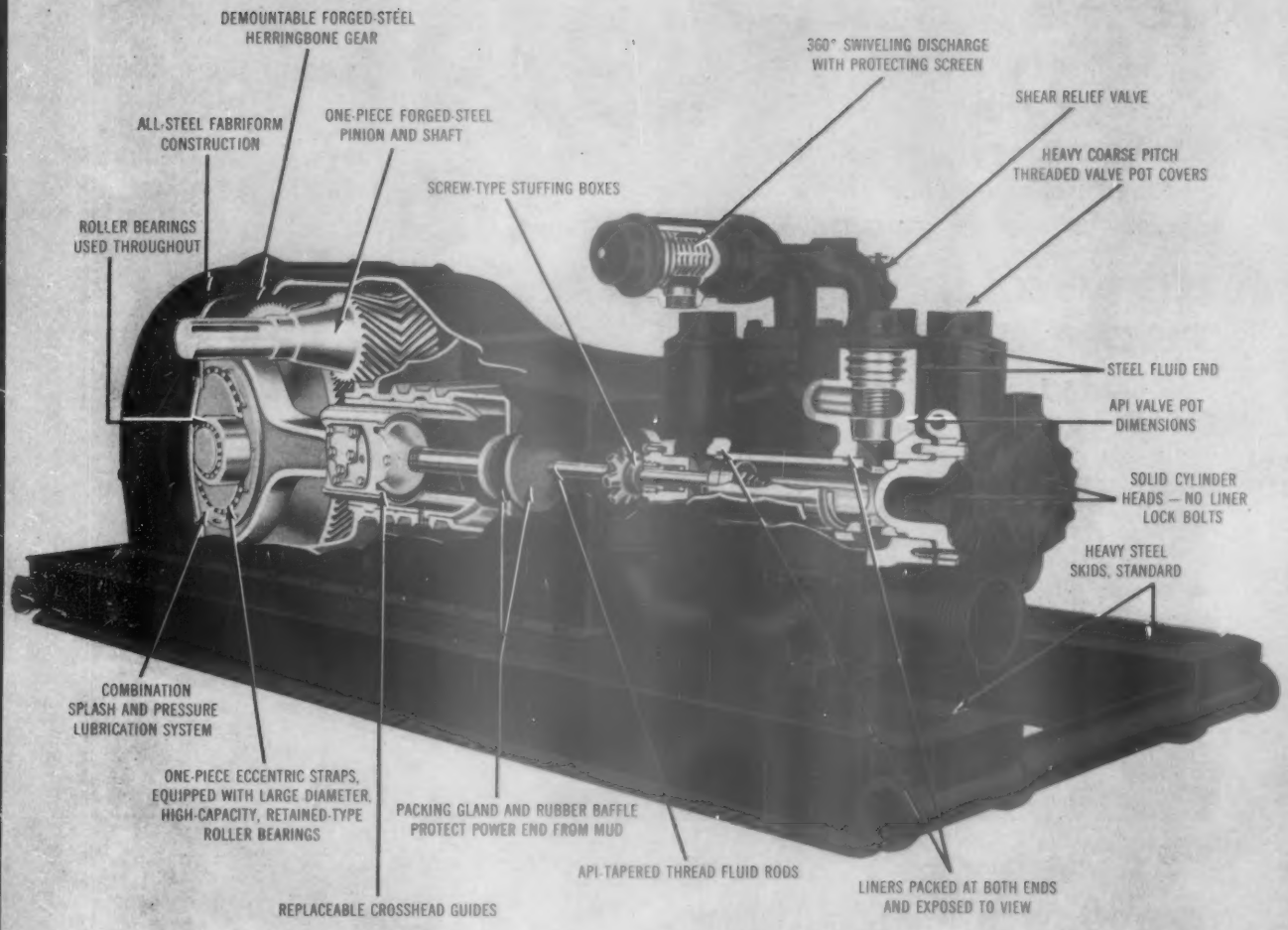
Halliburton

COMPANY • DUNCAN, OKLAHOMA

NOW 7 CONTINENTAL-EMSCO SLUSH PUMP SIZES

..a complete line able to provide all the mud pressures and volumes needed for today's drilling rigs

Feature by Feature..you can't beat these Pumps

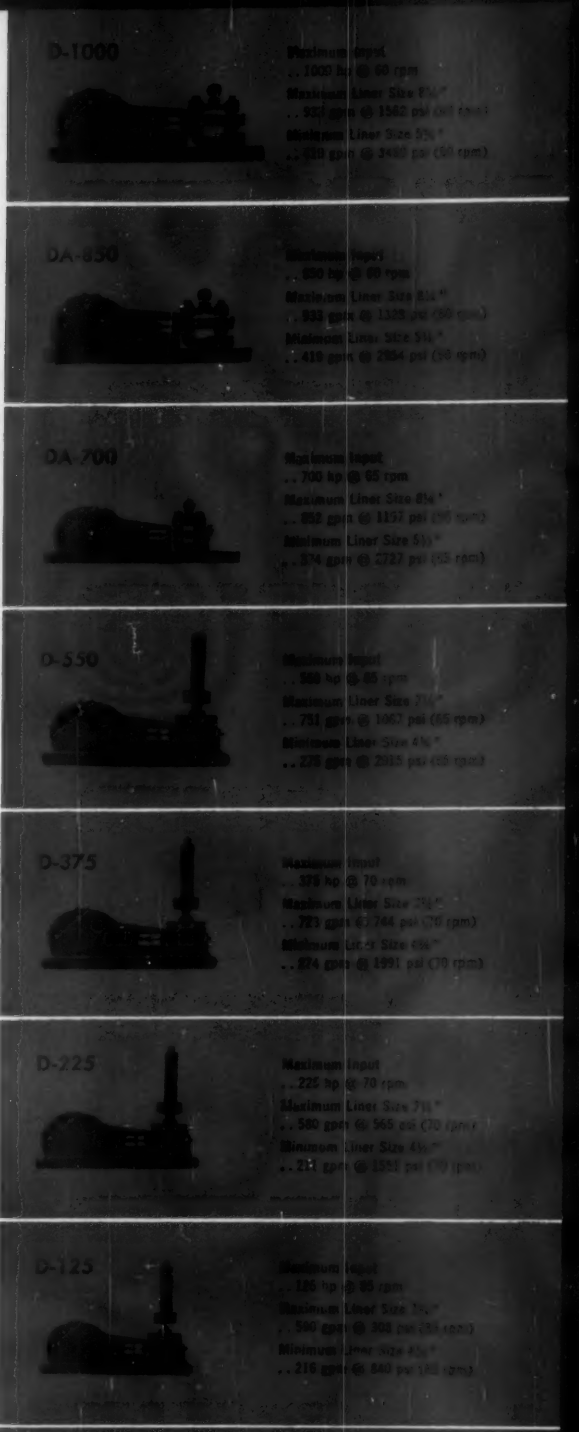

DEMOUNTABLE FORGED-STEEL HERRINGBONE GEAR
360° SWIVELING DISCHARGE WITH PROTECTING SCREEN
SHEAR RELIEF VALVE
ALL-STEEL FABRIFORM CONSTRUCTION
ONE-PIECE FORGED-STEEL PINION AND SHAFT
HEAVY COARSE PITCH THREADED VALVE POT COVERS
SCREW-TYPE STUFFING BOXES
ROLLER BEARINGS USED THROUGHOUT
STEEL FLUID END
API VALVE POT DIMENSIONS
SOLID CYLINDER HEADS — NO LINER LOCK BOLTS
HEAVY STEEL SKIDS, STANDARD
COMBINATION SPLASH AND PRESSURE LUBRICATION SYSTEM
ONE-PIECE ECCENTRIC STRAPS, EQUIPPED WITH LARGE DIAMETER, HIGH-CAPACITY, RETAINED-TYPE ROLLER BEARINGS
PACKING GLAND AND RUBBER BAFFLE PROTECT POWER END FROM MUD
API TAPERED THREAD FLUID RODS
LINERS PACKED AT BOTH ENDS AND EXPOSED TO VIEW
REPLACEABLE CROSSHEAD GUIDES

POWER END DESIGN

In place of bulky steel castings, a smooth, easy to handle steel fabriform frame is used. Fabriform construction allows critical stress areas to be reinforced scientifically, and it is as strong, yet lighter than castings. The massive main gear, of wear-resisting heat-treated forged steel, is designed to handle the highest of mud pressures. It is matched with a long-wearing, heat-treated forged-steel pinion, machined integrally with its shaft. Roller bearings, used throughout, reduce power loads and eliminate need for bearing adjustment. Crosshead guides (slippers in larger pumps) can be replaced for added years of pumping.

FLUID END DESIGN

Steel castings are electrically welded into compact fluid ends to handle the highest of mud pressures. Suction passages are large, direct and smoothly curved to speed fluid flow, even when pumping heavy muds. Use of one suction eliminates *dead spaces* which tend to restrict flow. A separate pot for each valve provides easy access to valve chambers. Screw-type valve-pot covers speed valve replacement. Patented "exposed" liner construction prevents costly washouts and damage to liner or fluid ends, because leaks can be spotted and packing tightened before damage occurs. Screw-type stuffing box glands apply an even pressure for packing and eliminate uneven packing wear and scoring of piston rods.



MANUFACTURED AND
SOLD WORLDWIDE BY

CONTINENTAL-EMSCO

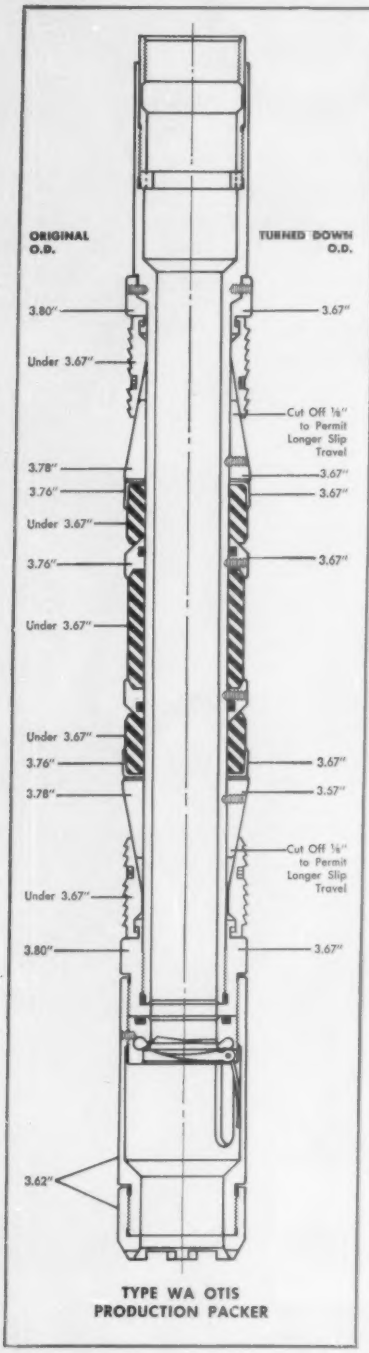
Serving the Oil and Gas Industries ... Worldwide

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube
Export Division: 30 Rockefeller Plaza, New York, N. Y. • Continental-Emsco Company Limited
Continental-Emsco Company C. A., Caracas, Venezuela • Plants: Houston and Garland, Texas; St. Albans, Herts, England •

SP901

OTIS PRODUCTION NEWS

Volume I, Number 3 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*



TYPE WA OTIS PRODUCTION PACKER

Two Standard Model 4½" Otis Production Packers Turned Down To 3.67" O.D. And Set in 5" Drill Pipe

HOUMA, LA. – Otis packer specialists from the Belle Chasse and Houma divisions recently solved an extremely difficult well completion problem for one of the major producing companies in their area, by turning down and setting two of their standard model 4½-inch Type WA Production Packers between tool joints in stuck 5-inch drill pipe. The fact that these packers could be turned down from their normal 3.80-inches to 3.67-inches and set in 4.30-inch I.D. pipe, saved the operator a considerable amount of rig time in addition to the cost of having special packers designed and built.

Well conditions at the time the Otis specialists were called in were as follows: 12,500 feet of 5-inch, 19.50-pound drill pipe had become stuck in a salt water flow during final drilling operations and could not be freed. As a result, the pipe had been cemented in place at that depth and cut off at 2900 feet, then tied back to the surface with 7-inch, 29-pound casing. The only potential producing interval was located at 11,600 feet. Before attempting to bring in the well, the operator wanted to plug below, and set a packer above, the potential zone.

Probably the most serious problem facing the Otis specialists on this particular job was the fact that the operator wanted the packers set in the pipe between tool joints. This meant any packer run into the well would have to have an outside dimension of less than 3.75-inches to pass through the tool joints, yet have a sufficient range to set and hold in the 4.30-inch I.D. pipe. Although none of the standard production packers or bridge plugs available today are designed to cover this range, the Otis specialists felt confident their packer could be turned down and run. In the interest of time and cost, the operator agreed to try it.

After first running a 3.68-inch O.D. junk basket to 11,800 feet, the first Otis packer, equipped with an expendable sealing unit, was run in to 11,744 feet and set. In that this packer was to serve as the bridge plug, it was set 4 feet below a tool joint so that the cement to follow would straddle the joint and give a stronger plug. Running time was approximately 5¾ hours, due to the viscosity and weight of the drilling mud. Once set, three dump bailer loads of cement were placed on top of the packer and allowed to set for 12 hours. At the end of that time, the plug was tested to 3500 p.s.i. Where fluid had been lost through the bit prior to plugging, there was no bleed down of pressure.

Next, the drill pipe was perforated and squeezed below and above the intended producing interval and the zone itself perforated. With these operations completed, another turned-down Type WA Packer was run and set between tool joints at 11,570-feet. A successful test to 1500 p.s.i. convinced the operator the packer would hold and swabbing operations to bring in the well were begun.

The help given this operator by his local Otis packer and completion specialists is typical of the service available from all Otis field personnel. Their knowledge of production problems and of the application, installation, and capacity of their equipment permits them to make sound, on-the-spot recommendations. The next time you find it necessary to consult with someone regarding packers or well completion techniques, call the Otis office nearest you or write Otis, Department 3-P, Box 35206, Dallas 35, Texas. You'll find experienced Otis well completion specialists ready to help you – anxious to serve you. © *1960 O. E. C.*

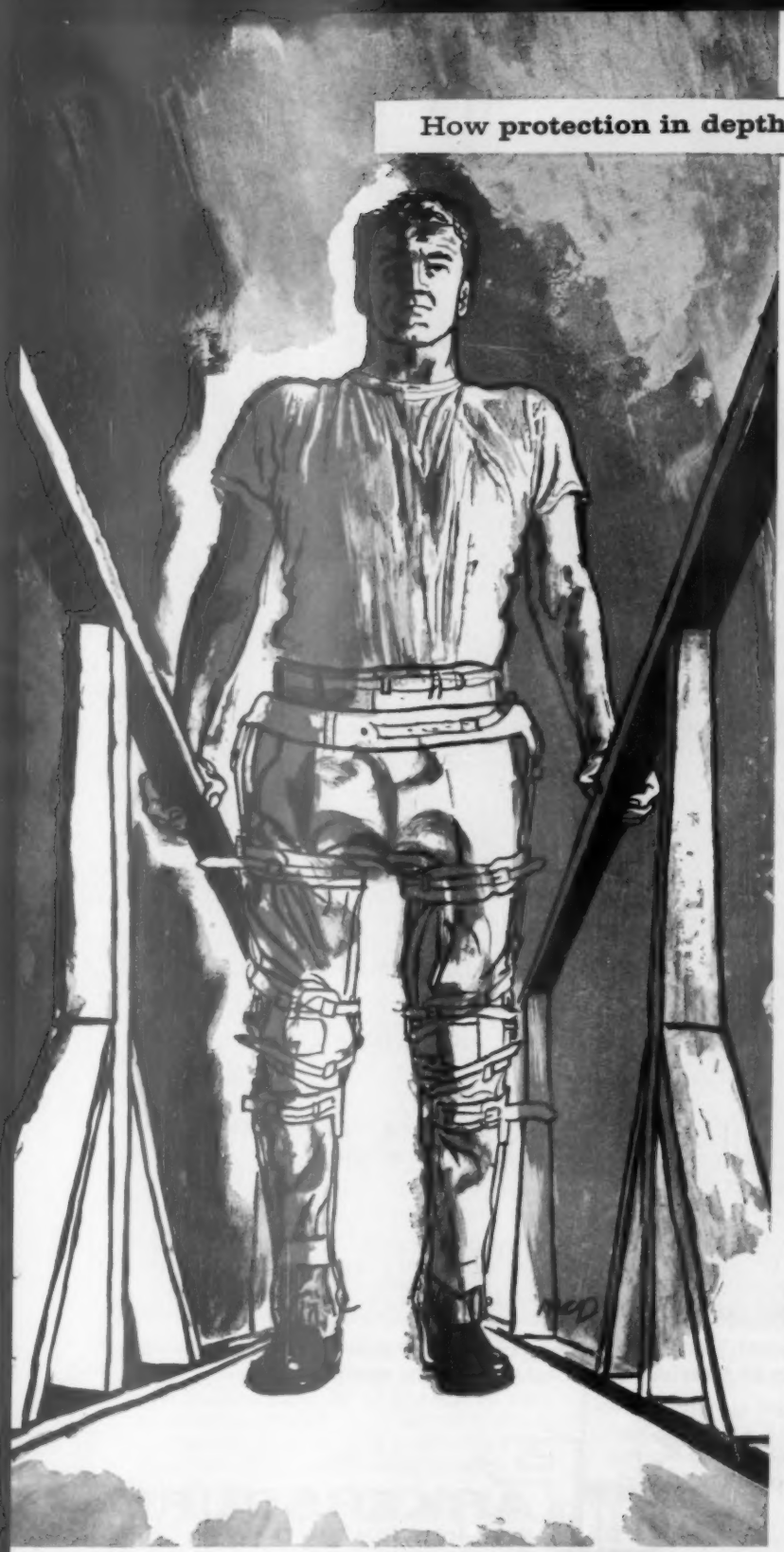
OTIS

Engineering OTIS Corporation

General Offices:

6612 Denton Drive • Dallas, Texas

How **protection in depth** helps cut compensation costs



Shortening the long road back

Any serious injury, from a critical sprain to a severed spinal cord, can incapacitate a worker indefinitely. The faster he can be restored to useful activity, the less the human suffering, the lower your medical expenses and compensation costs. Since 1943, Liberty's world-renowned rehabilitation services have helped many thousands of seriously injured workers return to work (nearly 4,000 were rehabilitated at our two fully-staffed centers alone). Rehabilitation is but one of the many Liberty Mutual services that add up to protection in depth. To learn more about Liberty's protection in depth and how it can help lower your business insurance costs, contact your nearest Liberty Mutual office.

Look for more from **LIBERTY MUTUAL**

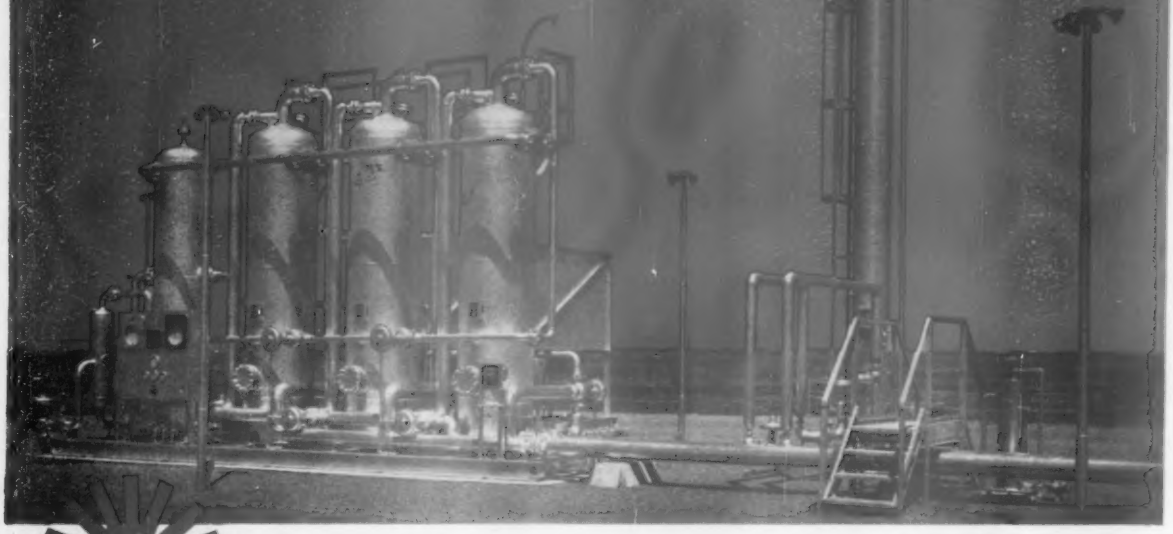
...the company that stands by you

LIBERTY MUTUAL INSURANCE COMPANY • LIBERTY MUTUAL FIRE INSURANCE COMPANY
HOME OFFICE: BOSTON

Business Insurance: Workmen's Compensation, Liability, Group Accident and Health, Fire, Fleet, Crime • Personal Insurance: Automobile, Fire, Inland Marine, Burglary, Homeowners

MAXIMUM

hydrocarbon recovery from your gas stream...



plus complete dehydration at no extra cost!

Maximum recovery... low-cost operation... greater profits... 3 big reasons why there are more PARKERSBURG DAU's on stream today than all other comparable units combined.

Get the **one** unit designed to do the complete job of hydrocarbon recovery with the quickest payout in the industry. Specify a PARKERSBURG DAU and start **saving** money the day you place your order... start **making** money the day you go on stream.

WHEN YOU BUY PARKERSBURG YOU GET 'EM ALL!

ENGINEERING . . . Parkersburg patents the process, not just the equipment.

MANUFACTURING . . . Parkersburg units are backed by rigid systems of quality control.

INSTALLATION . . . Parkersburg equipment installations are supervised by experts.

SERVICING . . . Parkersburg trains your men, services your unit any time, anywhere.

SEE YOUR PARKERSBURG MAN TODAY!

THE PARKERSBURG RIG & REEL COMPANY
Division of Parkersburg-Aetna Corp.
PARKERSBURG • HOUSTON • COFFEYVILLE

PARKERSBURG—The FULL LINE in Pressure Vessels . . . Separators, Metering Equipment, Treaters, Heaters, Knockouts and Oil Skimmers, Scrubbers, Hyrecos, Hydrocarbon Recovery Units, Glycol Dehydrators, Stabilizers.

the 1st

A.I.Ch.E. PETROCHEMICAL AND REFINING EXPOSITION!

NOW— for the first time in history—this show becomes a reality!

THE TIME: FEBRUARY 26—MARCH 2, 1961

THE PLACE: NEW ORLEANS, LOUISIANA

will you be there?

PLAN YOUR TRIP TODAY!

Hotel space is certain to be at a premium for this unusual show, so we suggest an early reservation. Contact the American Institute of Chemical Engineers, 25 West 45th Street, New York 36, N. Y. for details and further information.

For complete and up-to-date information on the latest petrochemical developments, you should become a member of the American Institute of Chemical Engineers. Just send in this coupon for full information.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS
25 West 45th Street, New York 36, N. Y.

Att: Membership Dept.

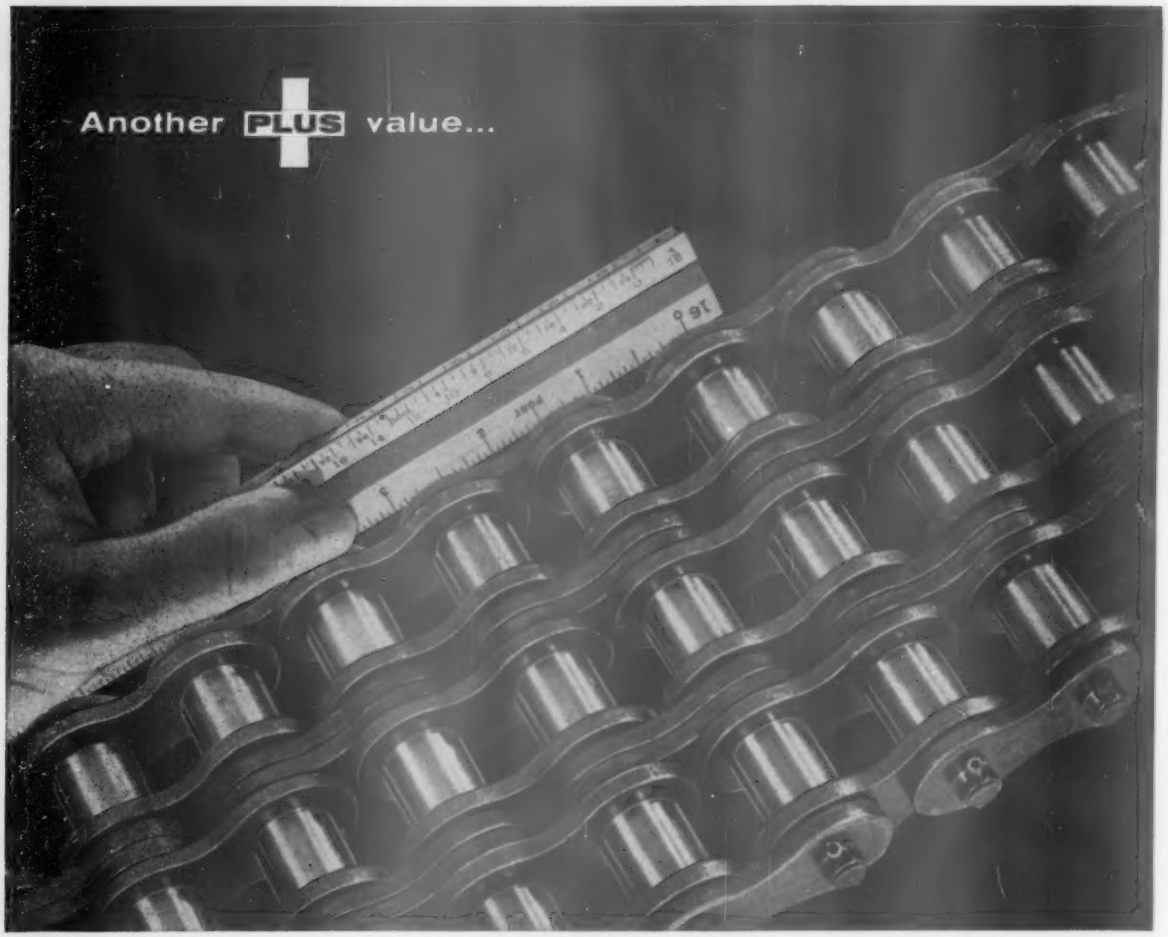
Please send me full information about the benefits of membership in the American Institute of Chemical Engineers.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____



PITCH CONTROL FOR HIGHEST FATIGUE STRENGTH

Accurate control of chain pitch is a *must* to meet the demands of today's drilling service. Variations in pitch cause uneven loading on the chain parts with resultant early fatigue failures.

In Rex Oil Field Roller Chains you get highest fatigue strength because pitch is *accurately* controlled...each link in the strand has controlled pitch as well as the entire strand. Link plates, bushings, rollers and pins are all designed and manufactured to extremely accurate tolerances to assure pitch control *throughout the long life of the drive.*

For longest life...highest fatigue strength, get the chains that give you ALL the *plus* values: Rex Roller Chains. Available in GLIDE-FIT (cottered) or DRIVE-FIT (riveted) styles. CHAIN Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis.

Get ALL the Plus Values

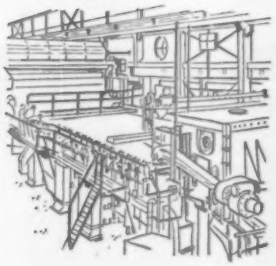
- Pitch control
- Guide-pierced and ball-swaged link plates
- Built-in beneficial stresses
- Positioned seam bushings
- Oil holes for effective lubrication
- Gap-free round rollers
- Roll pin fasteners...proved best

For Highest Fatigue Strength ...Longest Wear Life

REX® OIL FIELD ROLLER CHAINS

Oil Field Offices: Dallas • Houston • Los Angeles • Odessa • Oklahoma City • New York. Export Offices: Milwaukee • New York

there's more to Cities Service than meets the eye!



It takes giant machines to turn rags, straw, wood and other fibrous materials into paper. The huge "wet end" of a machine shown above is used in making stretchable papers.

This year our paper industry will produce more than 68 billion pounds of paper. It will take over 200,000 people to manufacture it.

And more than 400,000 people work in paper and allied-products industries to produce the myriad of paper products we use. Yet few of us realize the huge production task involved in manufacturing the paper we need.

And few motorists "filling her up" at their Cities Service station consider the enormous task of producing gasolene. Cities Service searches five continents for oil . . . maintains a pipeline system that can circle the globe . . . operates towering refineries and modern research laboratories. Cities Service has spent over a billion dollars so far in building and maintaining this vast network of facilities.

Only in this way can America have what it needs for progress —more jobs and more and better oil products.

Ten 20-ft. lengths of rigid pipe after being coupled. Two workmen did this job in only 20 minutes!

Workmen joining two sections of 1¼" rigid pipe.

ARIZONA PUBLIC SERVICE COMPANY SAVES 50% WITH RIGID PIPE

made of ABS Plastic

RIGID PIPE GAS SYSTEM INSTALLATION OFFERS NEW PROOF OF SUPERIORITY OVER CONVENTIONAL TYPE

Big news for happy housewives in Gila Bend, Arizona—the convenience of gas utility service for the first time! Important news for utility companies everywhere—the 50% savings over cost of conventional pipe gained by use of Anesite rigid ABS pipe made of CYCOLAC throughout the system! Saved precious man-hours, too! Arizona Public Service Company completed the job in record time . . . insured a failure-free system with this lightweight, leak-proof, AGA-approved pipe. Another example of better service . . . bigger savings from rigid plastic pipe in vital municipal installations!

BE *ABSolutely* SURE . . .
INSIST ON RIGID *ABS* PIPE
made of
CYCOLAC
THE BORG-WARNER PLASTIC THAT IS TOUGH, HARD AND CORROSION-RESISTANT

Write for the name of your nearest supplier

MARBON CHEMICAL
WASHINGTON

MARBON CHEMICAL
BW
BORG-WARNER

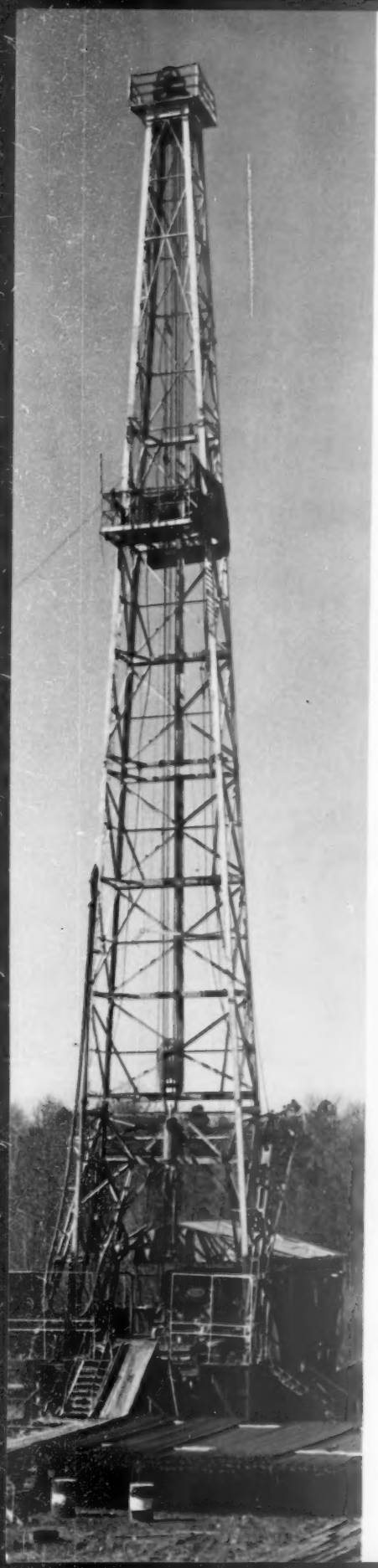
DIVISION **BORG-WARNER**
WEST VIRGINIA

New 2 1/16" OD SPANG tubing installed in multiple completion East Texas well.

Now! Spang has 2 1/16" OD tubing for multiple completion wells

Spang has expanded its line of oil well tubing to include 2 1/16" OD tubing. The new, small size is ideal for dual and multiple completion wells. Spang's tubular capacities are constantly being revised in this manner to keep ahead of your requirements for tubing, casing and drill pipe. You'll find it pays to standardize on these Spang products.

More about Spang tubing on next pages:

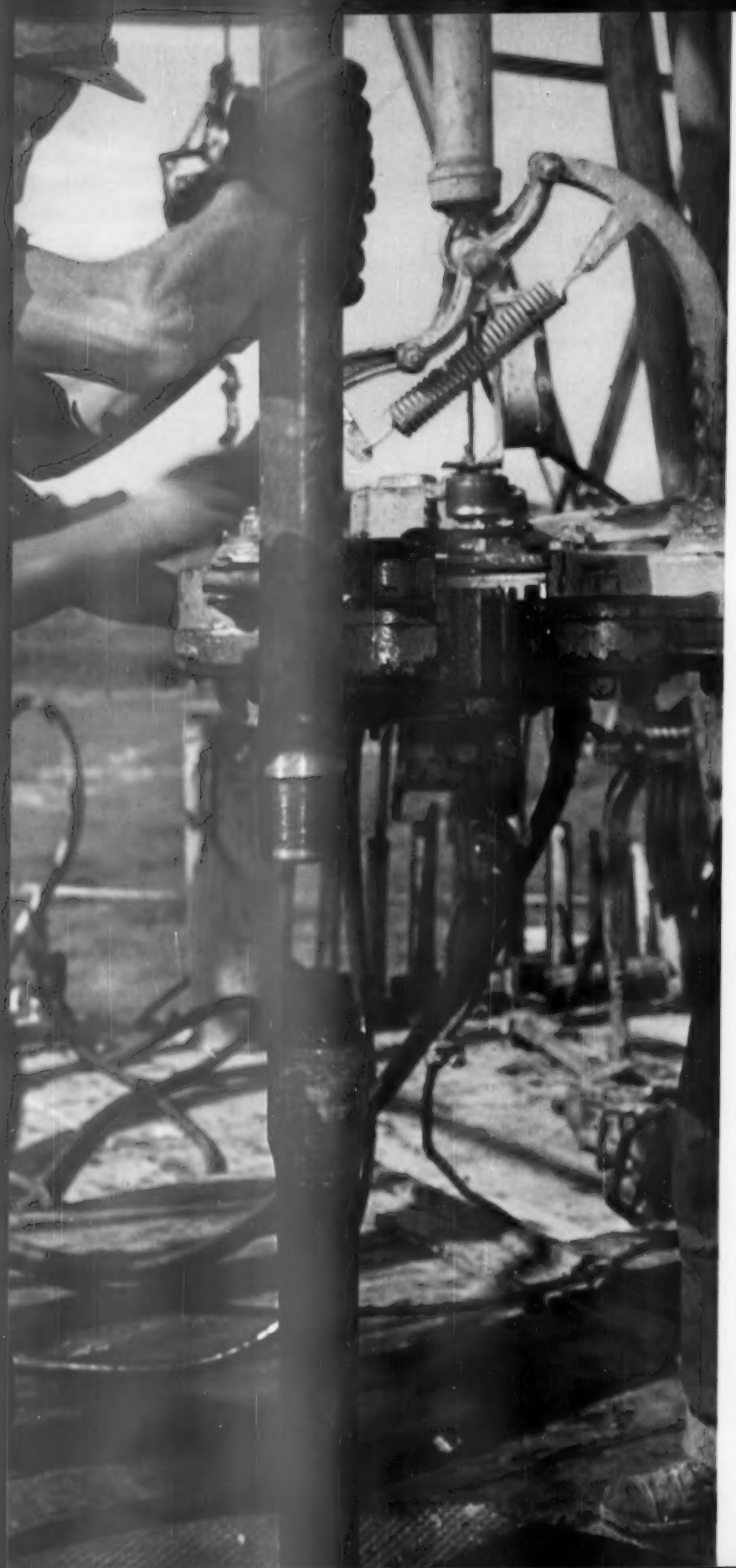


New tubing size meets needs of Multiple Completion Wells

Reports from field users verify successful performance of Spang's new, small size tubing in multiple completion wells. The 2⅛" OD tubing is now available with integral joint (upset) and threaded and coupled joint (non-upset). Respective nominal weights are 3.25 and 3.20 pounds per foot. Both types are supplied in grades J-55 and N-80. Your nearby National Supply representative has complete details. Call him soon.

This integral joint Spang tubing is readily available in grades J-55 and N-80. Tubing is always delivered in factory-perfect condition.

◀ Spang's new leak-resistant 2⅛" OD tubing was specified for this East Texas multiple completion well.



Streamlined SPANG Extreme Line tubing guarantees positive resistance to leakage

Integral design of Spang Extreme Line tubing results in a sealed joint that is always shoulder tight. Unique metal-to-metal seal resists leakage in the deepest, high pressure wells.

Extreme Line joints are streamlined internally and externally, minimizing possibility of hanging up or stripping under pressure. Integral joint eliminates 50% of the connecting threads in conventional designs.

Wide, heavy, modified Acme threads speed joint make-up with minimum chance of cross-threading.

Spang Extreme Line tubing is available in grades J-55, N-80 and P-105 to meet your toughest well conditions. It rounds out Spang's complete line of tubing for specific applications. Your National Supply representative always can recommend the exact Spang tubing that suits your requirements. Or write for new bulletin covering complete details.

Fast make-up is a sure thing with Spang Extreme Line tubing. Couplings are eliminated. Rugged joint permits repeated make-up and breaking out without galling.

Steel

Steel's Symbol of strength, long life, and economy

Spang CW steel pipe has wide application in gas, oil and water gathering lines.
User reports are unanimously enthusiastic about Spang pipe quality.

Superiority of SPANG CW steel pipe is due to many things . . .

UNIFORMITY Every length is manufactured under identical, closest possible quality controls on Spang's efficient production equipment.

TESTS AND INSPECTIONS All Spang pipe is thoroughly inspected and hydrostatically tested for strength. Each length is easy to cut, bend, thread and weld.

AVAILABILITY National Supply has the manufacturing and distribution facilities to assure availability of all pipe sizes—plain end or threaded and coupled—*when* you need them.

These are only a few of the reasons for the superiority of Spang CW pipe. And you get this special pipe quality without premium price. Call today for prompt delivery.

THE NATIONAL SUPPLY COMPANY
Two Gateway Center, Pittsburgh 22, Pennsylvania
Subsidiary of Armco Steel Corporation

DIVISION OFFICES: Calgary, Columbus, Dallas, Denver, Houston, Torrance, Tulsa
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E.C. 1

Litho in U. S. A.

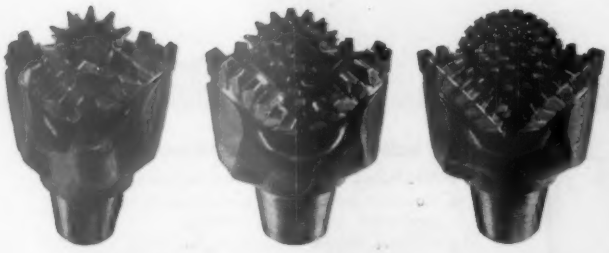
DEEP IN THE HEART OF TEXAS, TUNISIA, TAIWAN OR TRINIDAD, Security®

ROCK BITS ARE THE HEART OF DRILLING ECONOMY

Wherever in the world you drill for oil, Security rock bits save countless drilling dollars. That's because Security bits are specially designed, engineered and manufactured to assure dependable, high-speed penetration hour after hour. Security offers 1150 types, sizes and variations for every drilling need — deep in the heart of Texas, Tunisia, Taiwan, or Trinidad.

Worldwide Security users agree that the consistent, dependable performance of Security rock bits contributes immeasurably toward the achievement of maximum drilling economy. Get Security in *your* drilling.

Write for new 1960-1961 all-products catalog

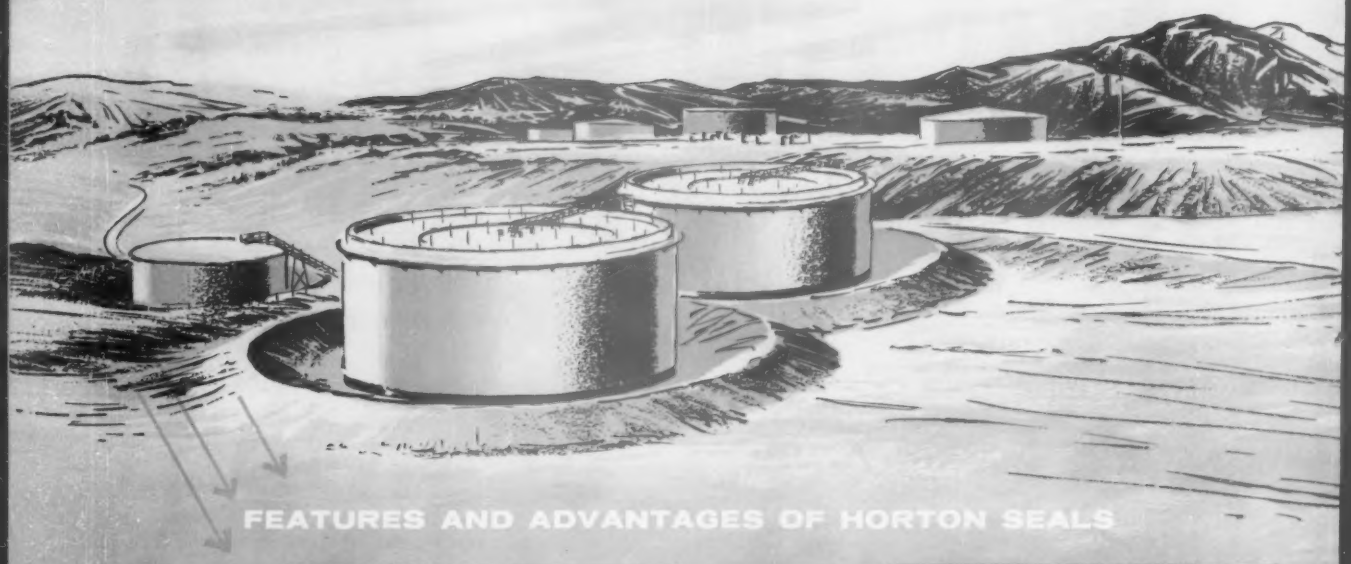


Get SECURITY In Your Drilling!

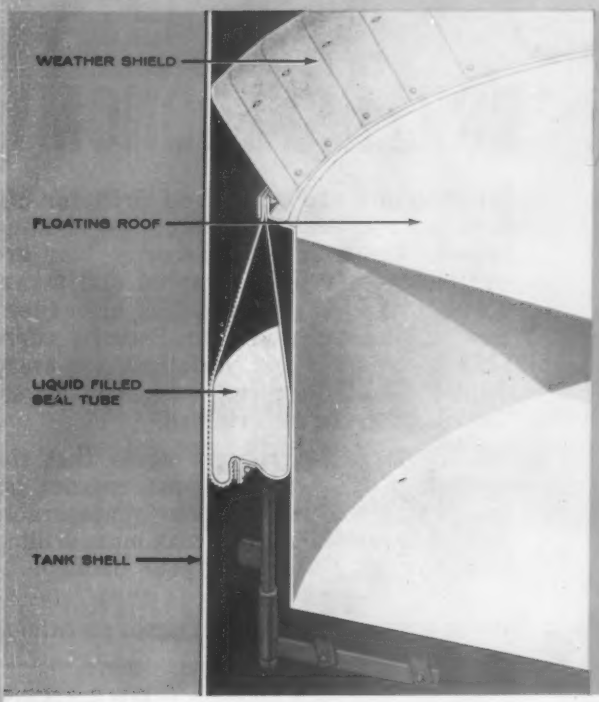
Security — DRESSER INDUSTRIES INC.
OIL • GAS
CHEMICAL
ELECTRONIC
INDUSTRIAL

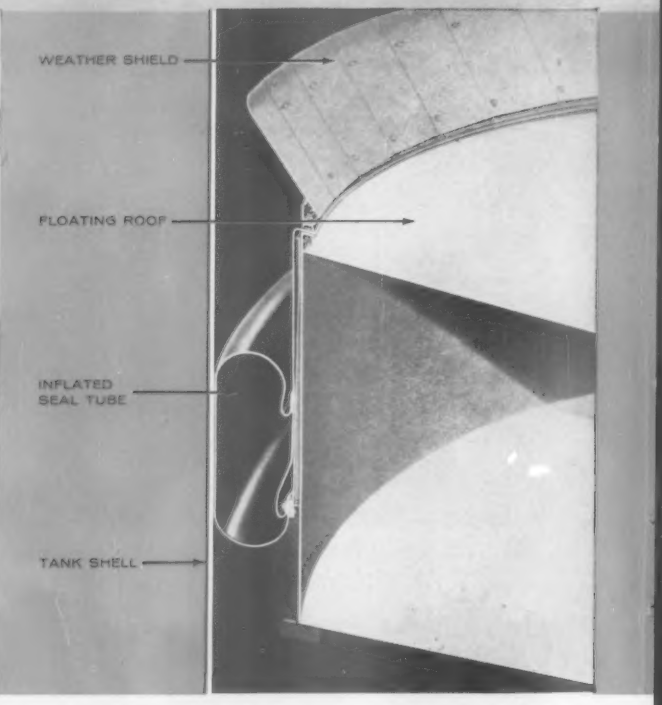
PLANTS... Dallas, Texas; Whittier, California; Manchester, England
SECURITY ENGINEERING DIVISION... 3400 W. Illinois, Dallas, Texas
EXPORT OFFICE... Post Office Box 13647, Dallas, Texas
CANADA... Security Engineering Canada, Ltd., Edmonton, Alberta, Canada
OVERSEAS... Security International C. A., Caracas, Venezuela; London, England

CB&I OFFERS THE



FEATURES AND ADVANTAGES OF HORTON SEALS





SR5 / HORTON LIQUID FILLED FABRIC SEAL

- Sealing liquid holds envelope against tank shell.
- Pressure against shell is greatest at bottom, decreasing to zero at top of contact.
- Flexible ring support provides adequate clearance and better fit for all rim space variations.
- Sealing band and rim band vulcanized at bottom connection.

SR6 / HORTON INFLATED FABRIC SEAL

- Gas holds envelope against tank shell.
- Constant mild pressure, maintained by simple gasholder, over entire surface.
- Positive means of supplying seal gas.
- Maximum clearance to accommodate rim space variations due to badly out-of-round shells.
- Vulcanized to form endless tube.
- Can be serviced from top of roof.

WIDEST CHOICE OF SEALS

for Floating Roof Tanks

More CB&I-built floating roof tanks serve the petroleum industry than the total constructed by all other manufacturers. The reason . . . superiority of CB&I structures in design, construction and performance in reducing evaporation loss, retarding corrosion and minimizing fire hazard.

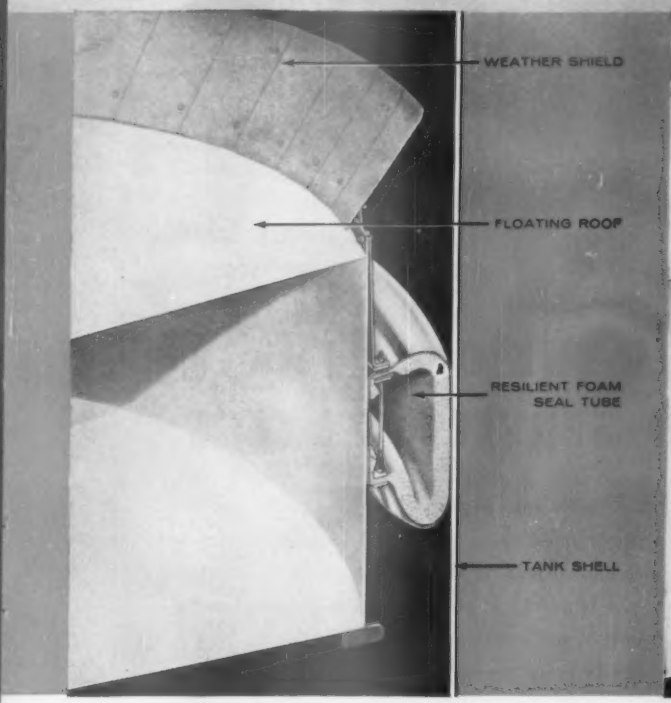
A key factor has been CB&I's continuous development of close-fitting, long-lasting Horton® Seals, which have set performance standards for the industry. Today, Horton Seals—both metallic and fabric—offer the widest selection of designs available anywhere.

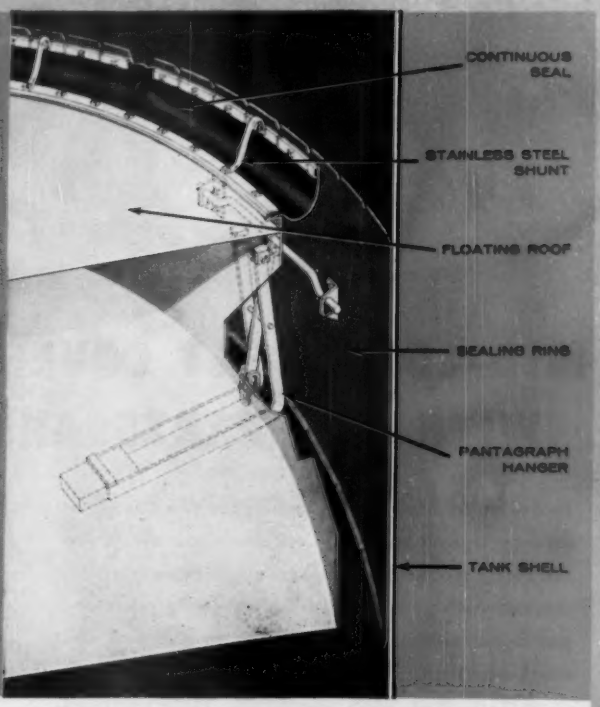
CB&I's extensive experience (since 1922) with all types of sealing designs is at your disposal. For an accurate appraisal of the proper sealing mechanism for your specific storage conditions, call or write the nearest CB&I office.

CHICAGO BRIDGE & IRON COMPANY

332 SOUTH MICHIGAN AVENUE
CHICAGO 4, ILLINOIS

OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD





SR7 / HORTON RESILIENT FOAM FABRIC SEAL

- Resilient foam holds envelope against tank shell.
- Mild and positive pressure against tank shell.
- Maximum clearance to accommodate rim space variations due to badly out-of-round shells.
- Endless sheet covers resilient foam, forming tight envelope.
- Can be serviced from top of roof.

SR3 / HORTON METALLIC SEAL

- Continuous steel sealing ring.
- Pantagraph hangers hold sealing ring against tank shell with minimum pressure.
- Hangers keep roof centered in tank.
- Continuous seal closes rim space.

Horton Floating Roofs are covered by U. S. Patents and pending applications.

P985CB

NOW...

MID-CONTINENT COVERS THE OIL COUNTRY WITH RIG PARTS AND SERVICE CENTERS

To assure available field service for Mid-Continent drilling equipment, Mid-Continent now offers the industry strategically located service centers stocked with genuine Mid-Continent rig parts . . . parts guaranteed against defects in material and workmanship. This vast network of service centers, staffed with competent, factory-trained personnel, stands ready to make repairs 24 hours a day, with top priority for emergency breakdowns. In most cases, repairs are made on location—which means less rig shutdown time. Yes, whenever . . . or wherever . . . you need Mid-Continent parts or service, call your nearest Mid-Continent service or sales representative.

MID-CONTINENT—SUPERMARKET FOR THE OIL INDUSTRY

PS1-0

MID-CONTINENT SUPPLY CO.

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

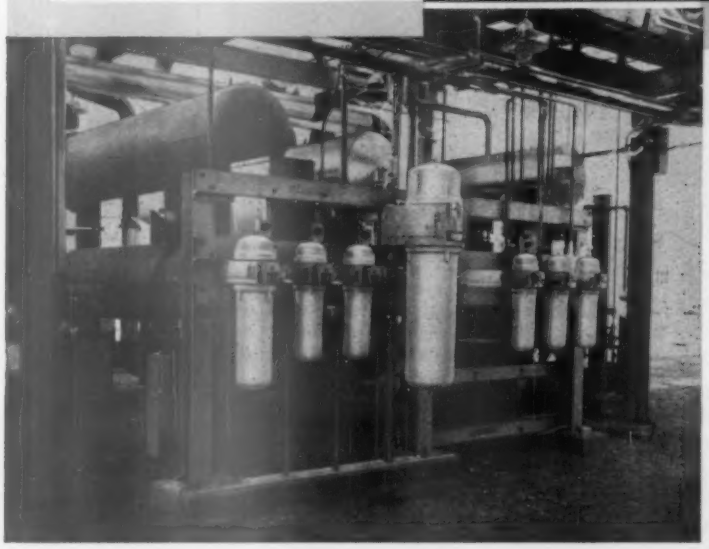
Mid-Continent Building, Fort Worth, Texas • Export Division: 45 Rockefeller Plaza, New York 20, N.Y. Cable: MIDCUMPORT NYK

Another Reason for choosing Square D...

NEW RACKS FOR SPIN TOP® ENCLOSURES

FOR HAZARDOUS LOCATIONS

...you now can order Square D Spin Top enclosed starters completely wired and mounted on racks built to your specifications. Or, working through our field organization, we'll help you or your engineers design the rack. Either way, all the wiring and assembly work is done at the factory. Rack framework can be either bolted and hot-dipped galvanized or welded and painted.



INSTALLING your Spin Top rack on the job is a breeze. Just bring in the feeder connections to the bus bars, and make the outgoing power connections from starters to motors. It's as simple as that! Square D's exclusive "*slide* and hook" mounting arrangement greatly simplifies starter inspection and maintenance.

Spin Top enclosures are available in four sizes to include circuit breakers, across-the-line starters and combination starters, Size 0 through 5, reversing, non-reversing, and two-speed versions. They're built for Class I, Group C and D; and Class II, Group E, F, and G service.

Write for details. Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

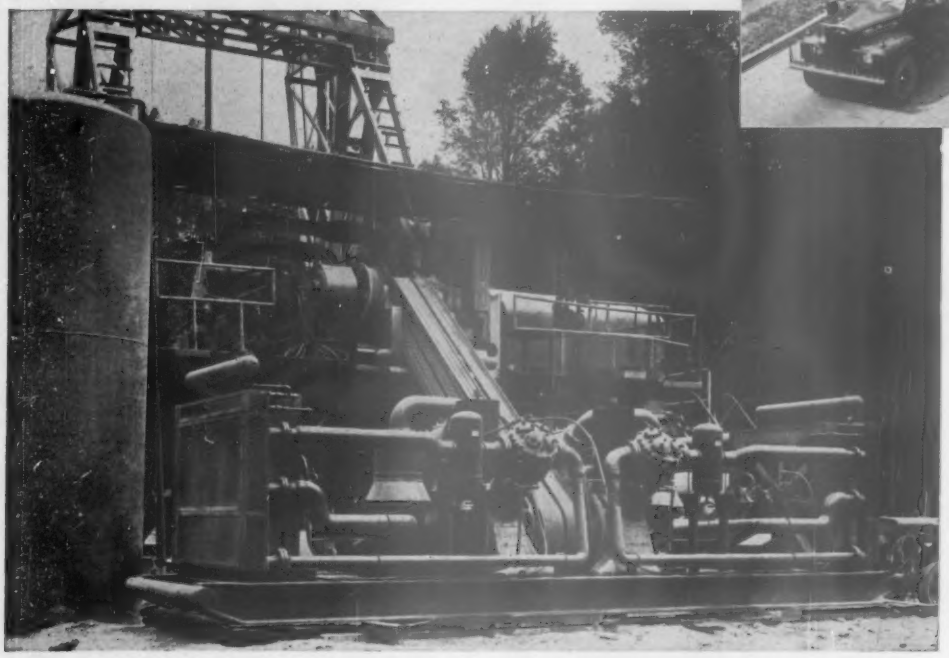
SQUARE D COMPANY

wherever electricity is distributed and controlled

For air drilling anywhere . . .

JOY COMPRESSORS

with over-the-road portability



Joy AR-1 rig driven compressor operating in West Virginia after long haul over dirt roads.

Joy "package" air drilling compressors are mounted on a single skid, completely within normal size limits for highway transportation. The bother and delay of special transport permits is eliminated.

These Joy compressors are designed specifically for air drilling service. The compressor units are built with the same durability found in rugged, heavy-duty stationary machines. All are designed for continuous operation over long periods.

One added advantage: remote controls at the driller's console permit the driller to operate the entire unit. An extra man at the compressor is unnecessary. Automatic controls regulate compressor loading and unloading at discharge pressure settings.

Air drilling operators can choose from three different self-driven or rig-driven models. Capacities from 50 to 6300 cfm; pressures from 52.5 to 500 psig. Find out more about Joy "package" compressors for fast air drilling plus fast over-the-road hauling. For additional information, write for bulletin 766-31.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

Turbocharging has increased output by 9000 hp on 42 existing compressor installations of the Richfield Oil Corporation, such as this one near Bakersfield, California.

Power output of Richfield Oil Corporation's 2 cycle natural gas compressors has been economically increased 30-40 per cent by the AiResearch multiple turbocharger system . . . utilizing existing compressors, personnel and plant size.

At the same time, during the three years in which turbocharged units have been in operation, unscheduled down time and maintenance have been at a minimum.

In addition to long service life, the turbochargers in the AiResearch multiple system are smaller, easier to handle and less expensive to maintain or replace than a large turbocharger of a single unit system.

These rugged turbochargers have also accumulated many years of proven trouble-free operation in a wide variety of the most demanding vehicular applications. Extremely simple in design and requiring no separate cooling system, they are another example of AiResearch leadership in the development and production of air-cooled turbochargers and turbocharger controls for all major engine applications.

Your inquiries are invited.

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

"WHY BUY A NEW RIG? BECAUSE THE RIGHT EQUIPMENT IS VITAL TO SUCCESS IN OUR BUSINESS!"

Charles F. Sarratt, V.P.
Chris Well Servicing Co., Ltd.

"Equipment is vital to us—our continued growth depends on our ability to anticipate the future needs of our customers. We needed a self-propelled rig that would do slim hole drilling to a depth of 8,000 feet, and deep workover and deepening jobs down to 15,000 feet. The Cardwell KM250 filled the bill," says Mr. Sarratt. "We can bid on jobs the smaller rigs can't handle, and we can underbid heavier rigs by $50 to $100 a day. Moving and rig-up costs are low, and so is maintenance. We've had only one major repair in a year. The total time lost was only 12 hours, and Cardwell stood behind the rig 100%."

Chris Well deepened the Anderson-Prichard Oil Corporation's No. 1 Gray "A" from 10,832 feet to 12,032 feet—the first well to be deepened by a workover rig through the Bromide into the Oil Creek section. Savings to the operator were substantial—about $1,500 in moving and rigging-up costs, plus more than $50 per day on day rates. The KM250 actually outperformed a heavier rig—drilling the hole through a special technique in 18 days less than a conventional rig on an offset well, and making the 12,000-foot round trip in less time than the heavier rig, which was handling triples.

In view of records like these, it's easy to see why progressive contractors favor new Cardwells. Contact us to find out what a new Cardwell rig can do for your profits.

for tomorrow's equipment—see Cardwell today!

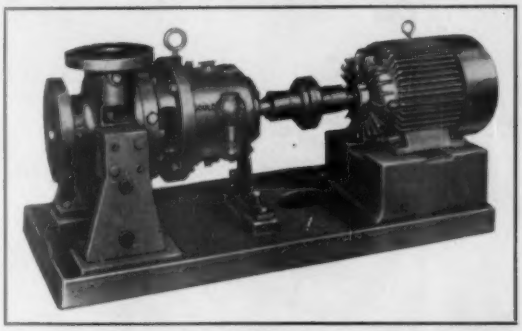
cardwell MANUFACTURING COMPANY, INC.

Box 2001, Wichita, Kansas • Cable: ALLSTEEL • Phone: AMherst 7-3311

THIS IS INTERMEDIATE-RANGE DESIGN

Robert Fornesi, Senior Application Engineer, Goulds Pumps, Inc.

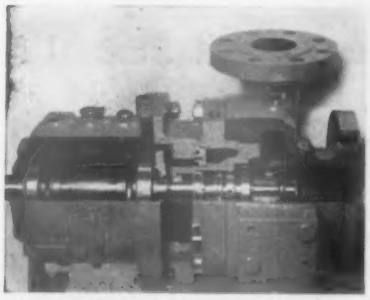
Changing requirements created this third dimension in process pump selection



Once upon a time you had to meet petroleum process applications with pumps in only these two ranges: (1) Light duty pumps to handle temperatures up to 200° or at most 300°. (2) Real heavy duty pumps for 200° to 800°. That's changed.

Here's why. Goulds product development group appraised the growing range requirements and services of petroleum process pumps. They found that 200° was no longer a realistic dividing line for process pump types. The need was for one pump which would handle all light duty applications and the growing number of intermediate applications as well.

Why should you have to buy a light duty pump with built-in temperature limitations when an intermediate-range pump could be built for almost the same price? Why should you pay for an 800° heavy duty pump to handle all the applications above 200° or 300°?



THIS DESIGN SOLVES HIGH TEMPERATURE SEAL PROBLEMS

Goulds designers felt they had the answer to both these questions in their plans for the Model 3775 line. This was not enough.

The design concept was verified by field research. The plans were rolled up from the drawing board and flown and shown all over the country. Plant superintendents and operating engineers saw them. They said yes.

They liked the rather obvious ideas that made INTERMEDIATE DESIGN POSSIBLE . . . the mechanical seal isolated in a seal chamber. This to allow for cooling of the liquid within the seal chamber. It made higher temperature handling with mechanical seals possible as it protected the seal. In similarly priced pumps the mechanical seal area behind the impeller is wide open. The hot pumpage is in constant contact with the seal. With the Model 3775 seals are not exposed to direct contact with hot pumpage. Cooler seals mean longer seal life.

COOLED CASING SUPPORT . . . A PLUS FEATURE

This was not enough. To be completely fit for INTERMEDIATE-RANGE (up to 650°) applications the Model 3775 had to have these features of costlier heavy duty pumps—cooled bearings and casing support.

Goulds Model 3775 has them all—water-cooled bearing housing and casing support as well as the seal chamber. This plus the choice of either internal or external flushing of the seal chamber. Single, double, balanced or unbalanced seals available to properly fit the application.

The pump is back pull-out type for easy maintenance. A spacer coupling allows you to remove the rotating parts without disturbing pipe connections or driver.

Built in accordance with API 610 specs, the fine mechanical features of this pump provide a husky line of pumps with maximum standardization and interchangeability of parts. Eleven sizes are built on the same bearing frame.

The Model 3775 is a horizontal center line mount with vertically split casings. Renewable casing wearing rings maintain proper clearance with impeller wearing rings. Leakage between suction and discharge chambers of the casing can be held to an absolute minimum.

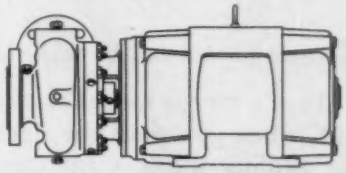
Talk over your process handling methods and problems with your Goulds engineer. He'll show you many more reasons why the INTERMEDIATE-RANGE 3775 is your best process pump choice for the majority of applications . . . *why it makes light duty pumps obsolete.* How it better fits the growing range of your process requirements.

AND AT LAST . . . A CLOSE-COUPLED PROCESS PUMP!

Goulds Model 3675 is the close-coupled version of the 3775. These units use the same liquid end as the frame mounts. The 3675 casing may be swiveled to four different discharge positions.

This integral pump-motor design provides the maximum in economy and compactness. Flexibility, too! One of our customers changed a process. A steel-case pump was required. Buy all new units? No, Goulds Model 3675 liquid ends fitted on the customer's present motors and provided the same rating. Only the casing was changed.

Get the complete story on these new pumps and all the others in the modern Goulds line. Send our factory the coupon below.



GOULDS PUMPS

GOULDS PUMPS, INC. Dept. 06J-100, Seneca Falls, N.Y., U.S.A.

Send me a bulletin with complete application data on your INTERMEDIATE-RANGE DESIGN petroleum process pump.

Anything else? Please check.

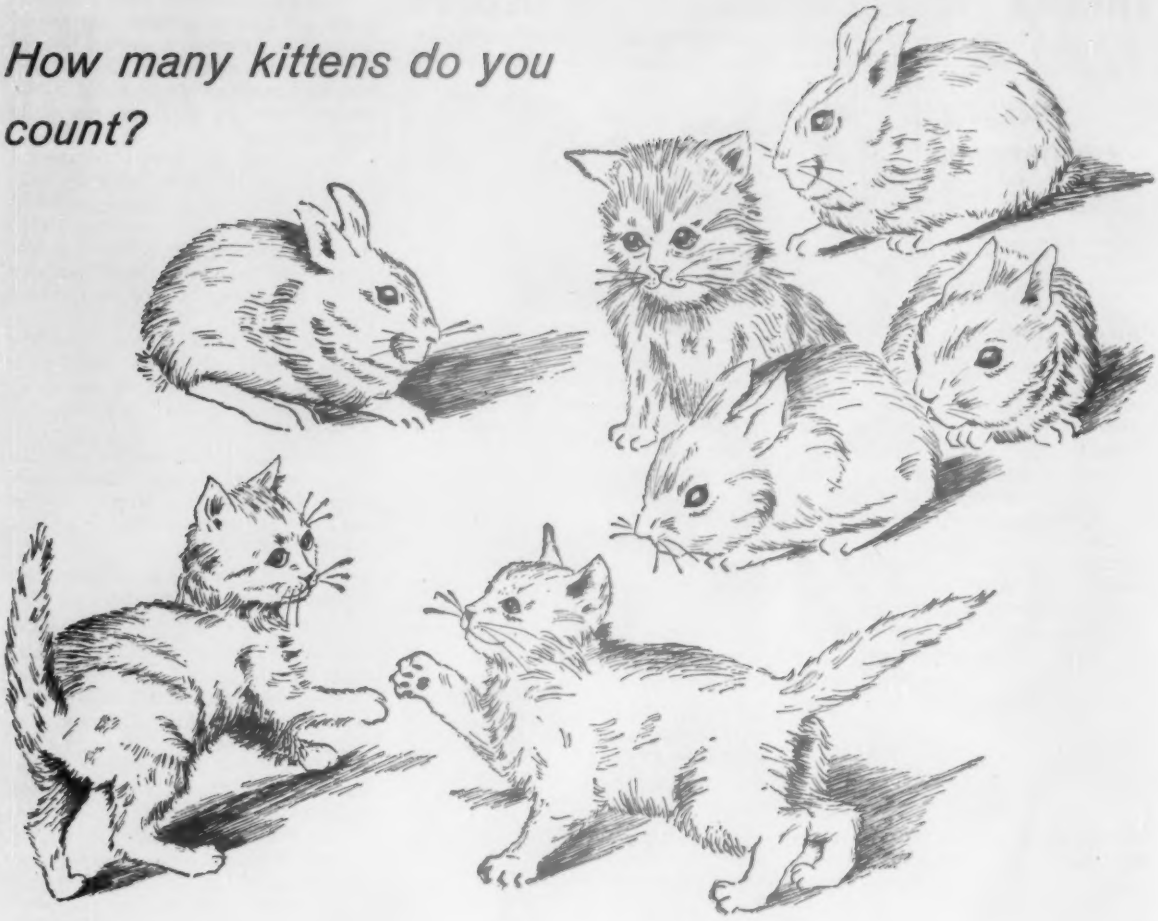
- ☐ 1-stage centrifugal—Model 3405
- ☐ 2-stage centrifugal—Model 3305
- ☐ Steel case Pumps Bulletin

NAME_____ DEPT. OR TITLE_____

COMPANY_____ ADDRESS_____

CITY_____ ZONE_____ STATE_____

How many kittens do you count?



Can you tell the real thing when you see it?

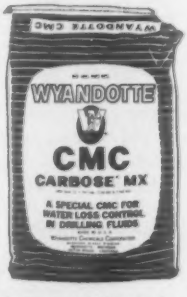
Generic names can be misleading.

That's why is makes sense to say CARBOSE MX when you want the right grade of CMC for drilling muds. CARBOSE® MX is Wyandotte's specially modified form of CMC that produces a tough, thin filter cake in muds. Investigate it . . . try CARBOSE MX.

Wyandotte offers a number of drilling mud additives, as well as materials for gas dehumidification, demulsifying, emulsifying, secondary recovery, water treatment, cementing, sweetening, and many other petroleum, refinery, and petrochemical applications. Get full details from your distributor, or write: *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Baton Rouge, Louisiana. Offices in principal cities.*

ANSWER: Young rabbits are called kittens, too. Did you count seven?

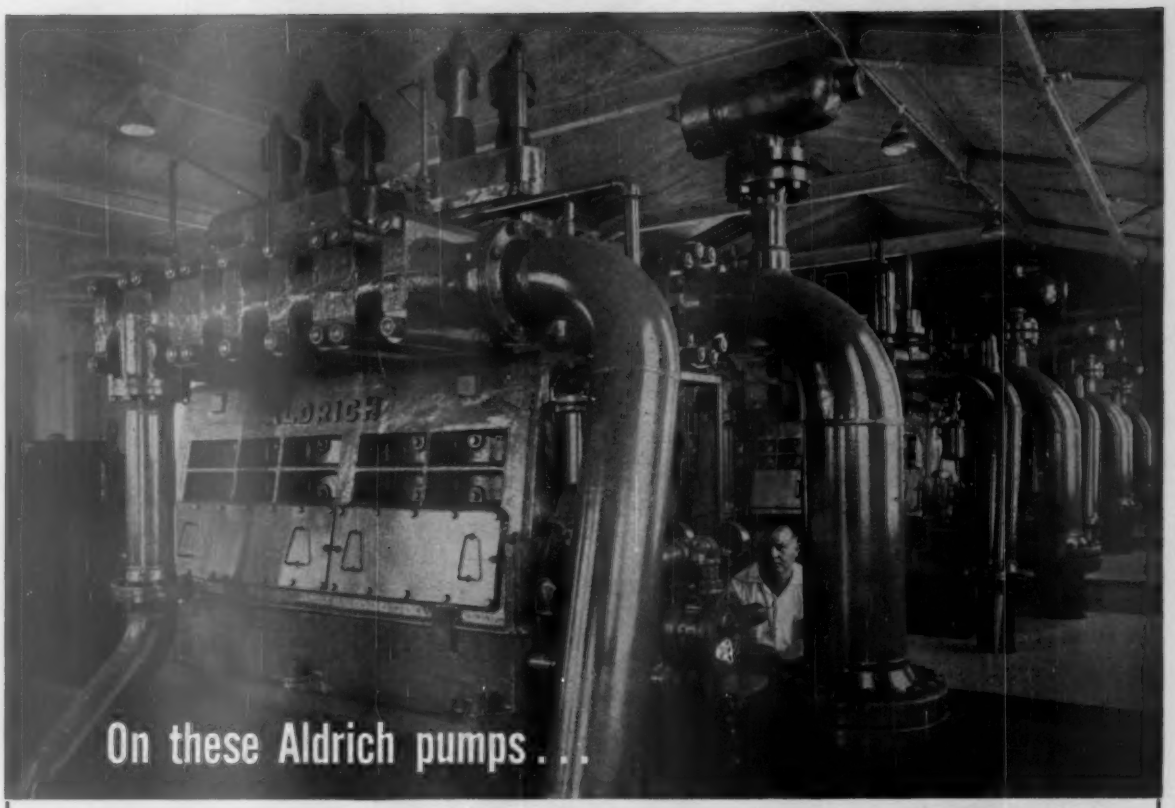
* * * * *



WYANDOTTE CHEMICALS

MICHIGAN ALKALI DIVISION

PACING PROGRESS WITH CREATIVE CHEMISTRY®



GULF OIL REPORTS 6 YEARS OF CONTINUOUS SERVICE WITH MINIMUM MAINTENANCE

FIELD REPORT

FLOOD: Goldsmith-San Andres Unit
OPERATOR: Gulf Oil Corporation
PUMPS: 4 Aldrich Quintuplex
FLOODING STARTED: October, 1954
EXPERIENCE TO DATE:

After six years, three pumps operate 24 hours a day, delivering some 54,000 bbl/day of sour oil field brine at 750 to 800 psi. Station designed for automatic operation. All maintenance handled by one man during eight-hour work day.

Field Parts stock available in Houston, Odessa, Alice and Wichita Falls, Texas; Casper, Wyo.; Hobbs, N.M.; Carmi, Ill.; Charleston, W. Va., Tulsa, Okla.; Los Angeles, Calif.; Calgary, Ontario. For further information write the ALDRICH PUMP COMPANY, 9 Gordon Street, Allentown, Pa.

the tough pumping problems go to ALDRICH

There are many Styles of Diamond Bits . . .

. . . because Christensen "custom engineers" diamond bits to overcome particular problems. On that next drilling, coring, reaming, or fishing job, ask your nearest Christensen office about diamond bits designed for you

"Less cost per foot"

CHRISTENSEN DIAMOND PRODUCTS

MAIN OFFICE AND PLANT 1937 SOUTH 2nd WEST

SALT LAKE CITY, UTAH

SERVICE FROM WORLD-WIDE SALES OFFICES AND MANUFACTURING PLANTS

92%

OF THE WORLD'S
OIL COMPANIES USE
MAGCOBAR
DRILLING MUD
PRODUCTS

All around the world it has been conclusively demonstrated that Magcobar's better-engineered drilling mud products reduce unnecessarily high drilling costs. Wherever you are, a planned Magcobar mud program can mean faster drilling rate with less down time. And at the same time, a cleaner hole, better cuttings, better logging, and better cores can result.

The benefits of a good mud program, a *planned* Magcobar mud program, are reflected in total drilling cost. These benefits can extend even to better and more production without the use of stimulants.

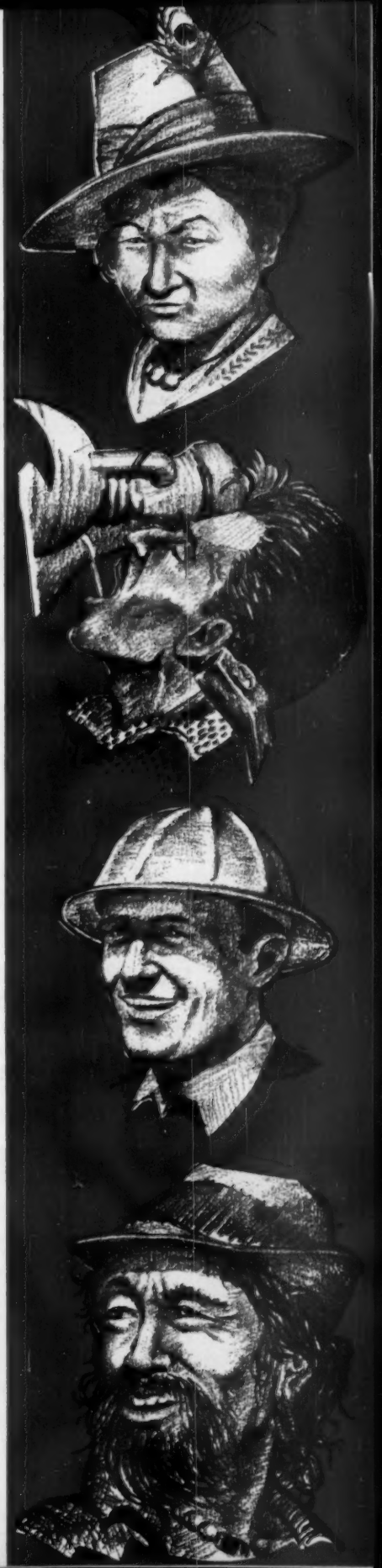
On your next well, reduce hole time, speed up drilling, stabilize the hole, and reduce wear and tear on drilling equipment. You'll be in good company, too, right along with the 92 per cent of the world's oil companies who use Magcobar now. And you'll be helping yourself with the better-engineered mud products of Magcobar.

Magcobar®
Complete
DRILLING MUD SERVICE

DRESSER INDUSTRIES, INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

MAGNET COVE BARIUM CORPORATION
Houston

Well Done With Magcobar Technology



"A great step forward with your Planetary Gears, Big Bearings and Cylindrical Crossheads."

— J. K. Butler

WHELAND PLANETARY
HP-16000 PUMP
Duplex Power Slush Pump
7¾" x 16", 600 H.P. at 65 RPM

OIL PRODUCTION MAINTENANCE, INC.
7440 CHOCOLATE BAYOU ROAD -- P. O. BOX 14291
HOUSTON 21, TEXAS
August 31, 1960

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

Our Wheland Planetary Pump is giving us increased penetration and good savings on bits. We know from more than 18 months of constant operation on 10,000 Ft. wells that our savings are substantial.

We have kept an accurate record on operating costs and all maintenance costs and are especially impressed by the low cost of fluid end expendables. The HP-16000 Pump has constantly operated near its rated capacity on more than 200,000 feet of hole in the Texas Gulf Coast Area.

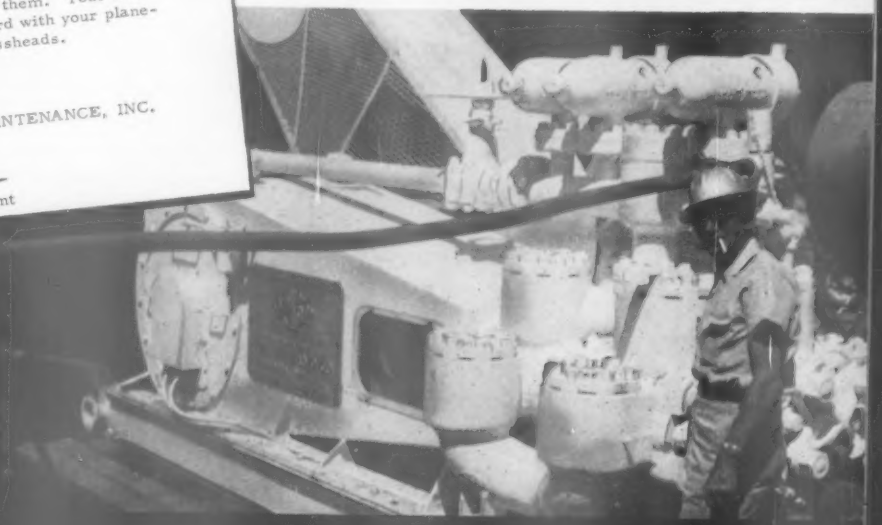
We are now operating Wheland HP-18000, HP-14000, and HP-16000 Pumps and are glad to recommend them. Your new HP-16000 Pump design is a great step forward with your planetary gears, big bearings and cylindrical crossheads.

Yours very truly,

OIL PRODUCTION MAINTENANCE, INC.

J. K. Butler

J. K. Butler, President



Wheland HP-16000 Planetary Pump owned by Oil Production Maintenance, Inc., on location in the Gulf Coast area.

WHELAND

ROTARY DRILLING MACHINERY

THE WHELAND COMPANY
CHATTANOOGA, TENNESSEE, U.S.A.

DRAW WORKS • SLUSH PUMPS • ROTARIES
CROWN BLOCKS • TRAVELING BLOCKS • SWIVELS

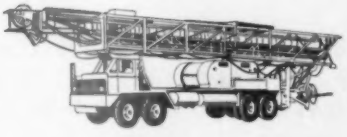
DOMESTIC DISTRIBUTORS: INDUSTRIAL SUPPLY COMPANY, INC.—Main Office: Wichita Falls, Texas • HOUSTON OIL FIELD MATERIAL COMPANY, INC.—Main Office: Houston, Texas.

EXPORT DISTRIBUTORS: LUCEY EXPORT CORPORATION—233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.

The Man Who . . .

PULLS OIL WELLS OUT OF TROUBLE.

When you're in trouble you look for a friend that you can depend on . . . just as oil men depend on servicing contractors to keep their wells pumping at top efficiency. And, experience teaches that the most dependable contractor is the one with **good equipment . . .** like Franks . . . equipment engineered and built to keep the contractor as well as the producer out of trouble. **So, next time you are faced with servicing problems, look for** **proven dependability. Ask the man who uses Franks . . .** about the equipment that keeps him out of trouble.



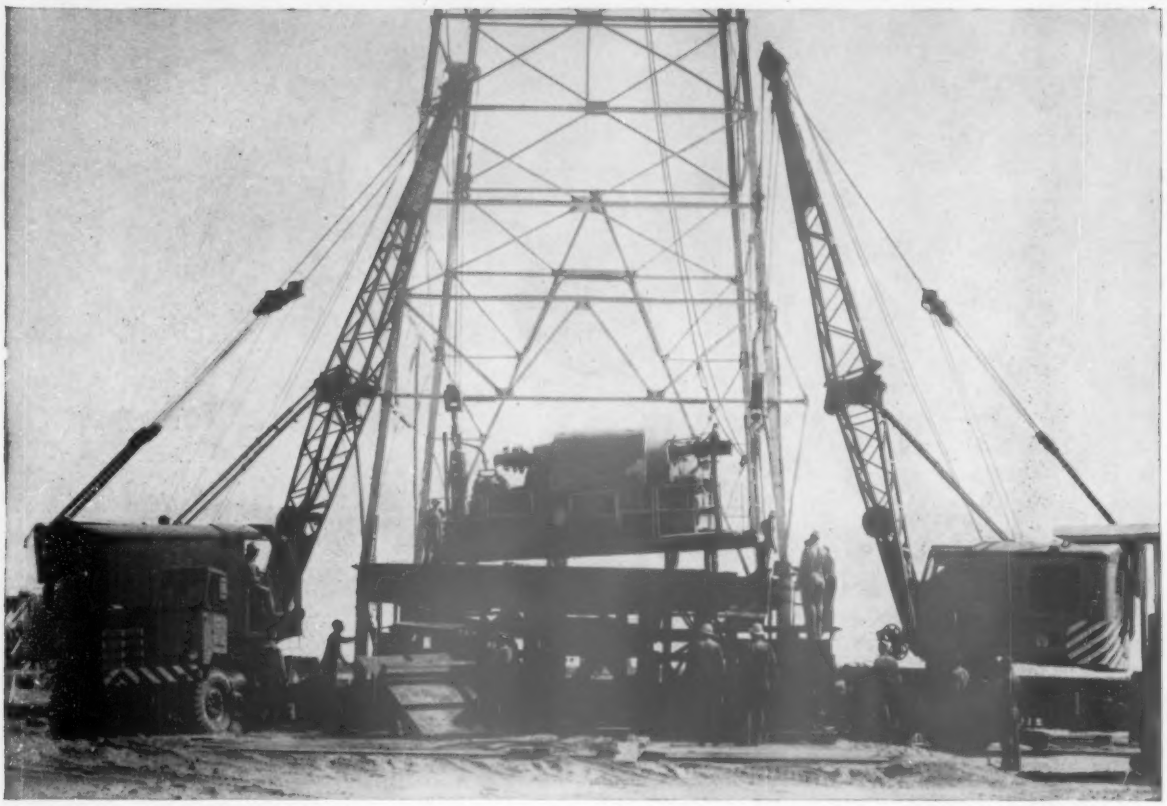
WELL SERVICING AND DRILLING UNITS

FRANKS

PAMPA, TEXAS

CABOT

CABOT CORPORATION
MACHINERY DIVISION



Geared by Fuller . . .Handling rigging operations for the Llano Drilling Company, on a well near Odessa, Texas, are two Northwest Truck Cranes owned by Odessa contractors Clyde Yarbrough, Inc., and J. H. Marks Trucking Co. (Information courtesy Drill Bit Magazine.)

6½-Hour Rigging Job with Fuller-geared Cranes

Six and a half hours from start to finish: that's the record of two Fuller-equipped Northwest Truck Cranes on a Texas oil well rigging job.

Handling the 78,000-pound drawworks and 16 tons of engines with ease, the 35-ton Northwest Cranes put the engine structure together, placed the drawworks and engines, and set the rotary table, traveling block and crown exactly where the crew wanted them . . . and did the whole job between 8:30 A.M. and 3:00 P.M.

Much of the credit for the agility of the 8 x 4 carriers, built by Hendrickson to Northwest specifications, goes to their rugged Fuller Transmissions. The 4-A-86 four-speed main transmission, in combination with a 2-A-92 two-speed auxiliary, provides a total of 8 forward and two reverse speeds for maximum performance under all working conditions. Fuller Transmissions have established an excellent record for availability, too . . . maintenance costs have been minimized and downtime for transmission repairs virtually eliminated.

Fuller Transmissions can help put more profit in *your* operation. For full details, see your truck or equipment dealer, or write Fuller Manufacturing Company.

FULLER

TRANSMISSION DIVISION
MANUFACTURING COMPANY
KALAMAZOO, MICHIGAN
Subsidiary EATON Manufacturing Company

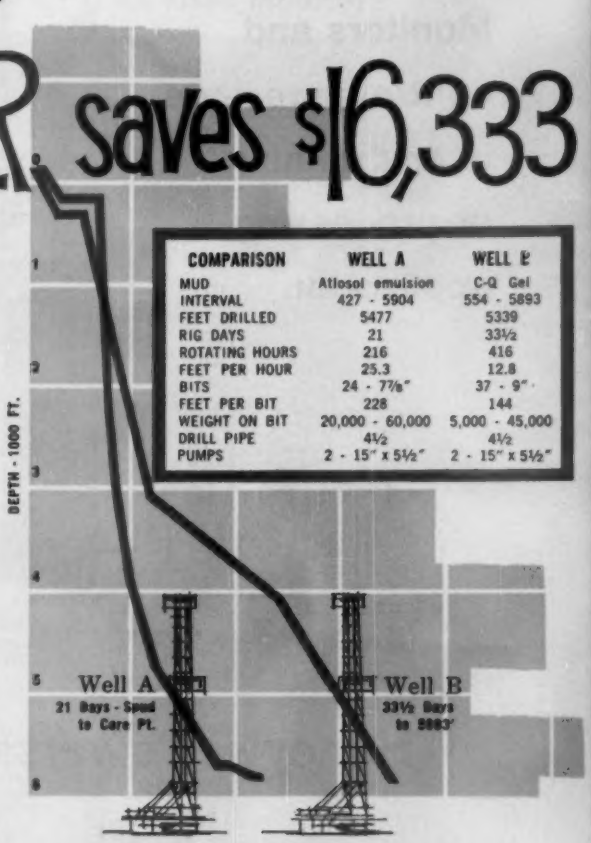
Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla. Automotive Products Company, Ltd., Automotive House, Great Portland Street, London W.1, England, European Representative

Faster Drilling-Fewer Bits

ATLAS EMULSIFIER saves $16,333

Faster drilling on Big Horn Basin Well, Big Horn County, Wyoming, cut rig time by 12½ days and required 13 fewer bits than offset Well B . . . both contractor and operator attribute savings directly to the mud program utilizing an Atlas emulsifier. Both wells were drilled with the same size equipment and under equivalent conditions. The mud program for Well A, however, was in sharp contrast to the high-solids, high-weight, high-viscosity muds generally used in this area. Acclaimed as the best-drilled well in the area to date, Well A used a low-solids oil-in-water emulsion with an Atlas emulsifier. This low-viscosity, low water-loss fluid maintained a trouble-free open hole, brought up clean cuttings and made the savings possible . . . a total of $16,333 in rig time and bit costs.

COMPARISON	WELL A	WELL B
MUD	Atlosol emulsion	C-Q Gel
INTERVAL	427 - 5904	554 - 5893
FEET DRILLED	5477	5339
RIG DAYS	21	33½
ROTATING HOURS	216	416
FEET PER HOUR	25.3	12.8
BITS	24 - 7⅞"	37 - 9"
FEET PER BIT	228	144
WEIGHT ON BIT	20,000 - 60,000	5,000 - 45,000
DRILL PIPE	4½	4½
PUMPS	2 - 15" x 5½"	2 - 15" x 5½"



ATLAS EMULSIFIERS IMPROVE A GOOD DRILLING FLUID
Because Atlas oil-in-water emulsion muds provide better oil action, they improve hole conditions, extend bit life, and increase penetration rates.

Better Hole Conditions. Atlas oil emulsion decreases torque as much as 50% . . . the hole is kept cleaner and pump pressures are correspondingly lower. There is less danger in lost-circulation and low-pressure zones.

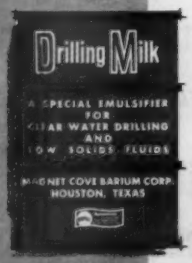
Longer Bit Life. Atlas oil emulsion prevents balling, provides better cutter and bearing lubrication. Greatly extended bit life reduces bit costs, reduces rig hours lost to trip time.

Faster Drilling Rates. Atlas oil emulsion makes more feet of hole per hour. Oil lubrication combines with improved hole condition to increase drilling rates in competent and troublesome formations.

Atlas emulsifier is sold through distributors under these tradenames . . . each is the product of Aquaness Department, Atlas Powder Company:

TRIMULSO®
Distributed by Baroid Division, National Lead Company
Registered trademark Baroid Division, National Lead Company

DRILLING MILK
Distributed by Magnet Cove Barium Corporation
Registered trademark Magnet Cove Barium Corporation


Drilling Milk
A SPECIAL EMULSIFIER FOR CLEAR WATER DRILLING AND LOW SOLIDS FLUIDS
MAGNET COVE BARIUM CORP. HOUSTON, TEXAS

ATLOSOL
Distributed by Milwhite Mud Sales Company and other selected mud companies
Registered trademark Atlas Powder Company

ATLAS Aquaness CHEMICALS ATLAS POWDER COMPANY

Aquaness Department, Atlas Powder Company
P. O. Box 21072 • Houston 26, Texas

Monitors and controls pressure in any refining or processing application

Honeywell's versatile Bourdon-tube PRESSURETROL*

- **Suitable for all gasses, fluids and steam**
- **Ranges from 30 to 3000 psi**
- **Standard and explosion-proof models available**
- **FM, UL, FIA approved**

Honeywell Pressuretrols precisely measure and control pressures of any fluid, gas or steam. They can be used to sound an alarm or control a valve, pump or compressor. These are heavy duty devices designed specifically for industrial use.

The Pressuretrol can be flush or surface-mounted on a panel, or installed directly on a pipe. Settings are made with one high and one low pressure knob conveniently located on face of the unit. The mercury switch can be easily seen through a protective glass window. Depending upon pressure range, bronze, stainless steel and beryllium copper Bourdon tubes are available. Choice of control to make on pressure rise or fall.

Model P428	
Range (psi)	Maximum (psi)
30—300	375
50—600	750
100—1000	1200
200—2000	2400
300—3000	2500

Model P444	
Range (psi)	Maximum (psi)
20" vac—40	75
1—20	50
5—50	80
5—150	200

No matter what your pressure-control need, Honeywell can supply it for you. Call your local Honeywell office or write Honeywell, Dept. OJ-10-41, Minneapolis 8, Minnesota. In Canada, write Honeywell Ltd., Seaside, Toronto 17.

See us in Sweet's 1960 Product Design File, Section 5b-Min.

*Trademark

Honeywell

First in Control

SINCE 1885

75th YEAR — KEEPING THE FUTURE

ALL-WEATHER®

oil field motors

Only R&M builds "ALL-WEATHER®" MOTORS!

"All-Weather" is a registered trademark for Robbins & Myers oil field motors! This means that only from R&M can you get this exclusive, fully-protected motor design which assures dependable, long-life service under all environmental conditions: wind-driven rain, dampness, corrosive atmospheres, hazardous condensation, dust and dirt. Write today for your copy of R&M's "All-Weather" motor bulletin 520-0G

ROBBINS & MYERS, INC., Springfield, Ohio

Fractional and Integral HP Electric Motors • Electric Hoists and Overhead Traveling Cranes • Moyno® Industrial Pumps Propellair® Industrial Fans • R & M-Hunter Fans and Electric Heat • Trade-Wind Range Hoods and Ventilators

Subsidiary companies at: Memphis, Tenn., Pico Rivera, Calif., Brantford, Ontario.

They Say—

More of the same, please

Dear Sir:

I have read with great interest your article entitled, "Why the Farmout Business is Booming." (OGJ, Aug. 8, p. 46).

The subject of discussion is timely, well chosen, and highly informative. It engrosses the reader to the extent of expecting more deliberation on the issue.

In this connection, I would like to request your good office for more items treating on the same subject matter which may, in one way or another, give me a comprehensive study on this important development.

Geronimo Battung, Jr.
Assistant to the President
Pacifica, Inc.
Manila, Philippines.

New faces on the way?

"Unless we, individually and collectively, put our industry house in order, 5 years hence there will be an entire new set of faces in management and operation in this industry.

"The race to keep the rigs busy has resulted in bidding for work, not with our own costs in mind, but only with the idea to get the price a dime or more lower than we think our competitors will bid.

"If you think you can do a better service than your competitor should that quality not be worth more than his price? In other words, we are not good salesmen—we have tried to let the dollar sign do our selling.

"What I am hoping the members of the industry will do in self-preservation is to get down to hard cold evaluation of their own prospects. It is not yet a social disgrace to make profits, provided they are honest and justifiable.

"It is a considerable expense today to keep records and to assemble figures for realistic cost estimate. The federal government requires certain records be kept to fulfill income tax and social security requirements. Our responsibility to ourselves should require records to enable us to achieve the means of attaining profit or avoiding losses.

"The evils which beset us are not of recent origin; they are but a gradual culmination of conditions of our own making. They will not be overcome this year or next, but we

the OIL AND GAS JOURNAL

TULSA OFFICE
211 South Cheyenne Avenue
Box 1260
Phone LUther 4-4411

George H. Weber ... Editor
Henry D. Ralph ... Chief Editorial Writer
Ted A. Armstrong ... News Editor
Gerald L. Farrar ... Engineering Editor
Frank J. Gardner ... Exploration Editor
Paul Reed ... Pipeline Editor
W. L. Nelson ... Technical Editor
Lynn M. Nichols ... Presentation Editor
John C. Casper ... Economics Editor
W. B. Bleakley ... Production Editor
Neil Williams ... Associate Editor
Peter B. Bike ... Geophysical Editor
H. S. Pylant, Petrochem. & Gas-Process. Editor
John P. O'Donnell ... Asst. Pipeline Editor
Jo Jeanne Speaker ... Staff Artist
R. B. Tuttle ... Equipment Editor
C. Dudley Johnston ... Art Director
Robert B. Bizal ... Editorial Research
John C. McCaslin ... District Editor
W. A. Bachman ... District Editor
Merle F. Blakely ... District Editor
Sara Duncan ... District Editor
Kenneth W. Brooks ... District Editor
Norman K. Baxter ... District Editor
Max L. Batchelder ... Asst. Pres. Editor
Helen Brown ... Editorial Assistant
Alice Burt ... Editorial Assistant
Aileen Cantrell ... Editorial Assistant
Margaret Higgs ... Editorial Assistant

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

D. H. Stormont ... Refining Editor
Paul Swain ... International Editor
Gene T. Kinney ... East Coast Editor
Ray G. Gibson ... District Editor

DALLAS OFFICE
1238 Mercantile Building
Phone RIverside 8-5701
Robert J. Enright ... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone MAdison 2-0722
Carl J. Lawrence ... West Coast Editor

HOUSTON OFFICE
802 American Investors Building
Phone CApitol 4-7726
Ed McGhee ... Drilling Editor
Howard M. Wilson ... District Editor
H. C. Bozeman Gulf Coast Refining Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710
Clyde La Motte ... Washington Editor

BUSINESS STAFF
P. C. Lavinger ... President
S. H. Rourke ... Executive Vice president
Mitchell Tucker ... Vice Pres. and Adv. Mgr.
Kenneth B. Barnes ... Vice Pres., Eastern Hemisphere Operations
Hanson B. Pigman ... Vice Pres., Circulation
L. John Ford ... Mgr. Industry Census
J. Parker Holland ... Production Manager

ADVERTISING STAFF
TULSA OFFICE
211 South Cheyenne Avenue
Phone LUther 4-4411
John D. Reilly ... Mid-Continent Manager
Roy E. Finley ... District Manager
Philip C. Lavinger, Jr. ... Representative
D. B. Miller ... Classified Adv. Mgr.

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910
E. S. Klappenbach ... Eastern Manager
Harry B. Bullen ... District Manager

PHILADELPHIA OFFICE
1509 Land Title Building
Broad and Chestnut Streets
LOcust 3-0118
John W. Meany, Jr. ... District Manager

PITTSBURGH OFFICE
Law & Finance Building, 429 Fourth Ave.
Room 1505, GRant 1-5847
Ernest S. Holzworth ... District Manager

DETROIT OFFICE
204 Washington Square Building
Royal Oak, Mich., LIncoln 7-9455
John D. Yoder ... District Manager

LOS ANGELES OFFICE
650 South Grand Avenue, MAdison 2-0722
George O. Ruppert ... District Manager

CHICAGO OFFICE
105 West Madison Street
Phone CEntral 6-2537
David T. Kenney ... District Manager
Karel Wegkamp ... District Manager

HOUSTON OFFICE
802 American Investors Building
CApitol 4-7726
John M. Spears ... Gulf Coast Manager

DALLAS OFFICE
1238 Mercantile Building
RIverside 8-5701
Pren G. Hollingsworth ... District Manager

ENGLAND
38, Victoria Street, London S.W. 1
Phone ABBey 6302

GERMANY
29 Hunsrücken Strasse,
Düsseldorf (Alstadt)
Phone 1-49-04

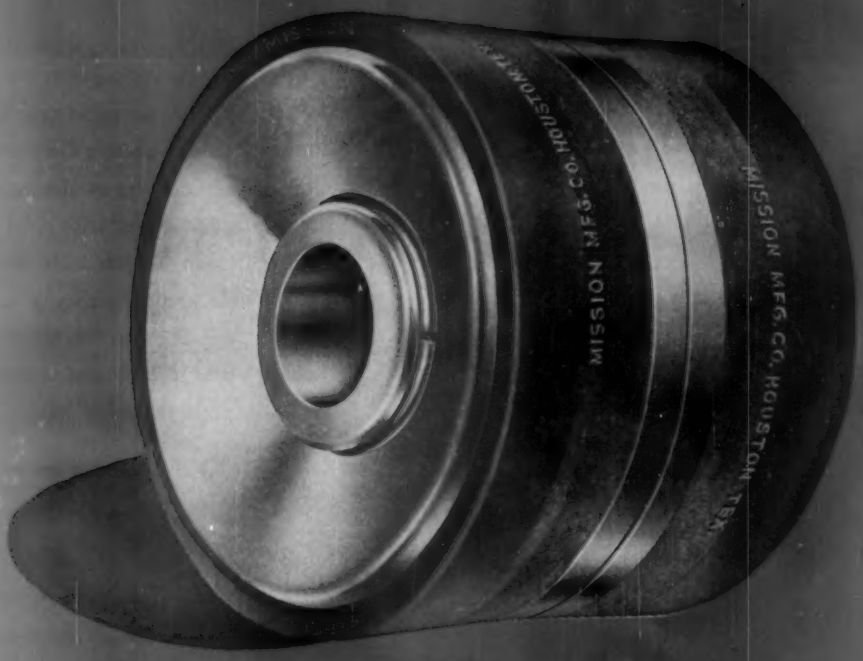
FRANCE
6, rue Franklin Roosevelt, Paris 8e
c/o Soc. D'Etudes Petrolieres, 3 Etage
Phone, BALzac 66-70

Kenneth B. Barnes ... Vice Pres., Eastern Hemisphere Operations, Representative

Subscription rates to the petroleum industry United States and foreign, 1 year, $5.00; 2 years, $8.00; 3 years, $10.00. Single copies $1.00. Back copies when over a year old, $2.00.

Member
Audit Bureau of Circulations
Associated Business Publications

the name **Mission** here



is your guarantee of real savings here

Take a good look at this Mission piston. Mission was first with this design, although today you'll see other pistons made to look like it. You see, the engineering advances that have gone into Mission pistons have made them the standard by which all others are judged.

Replaceable rubbers, long-life rubber compounds, special fabric backing, one-piece forged steel bodies, hardened piston flanges, close tolerances, wear groove in piston body flanges, API taper for piston bore, and easy and reliable snap rings and end plates are some of the specific reasons Mission pistons are superior.

The unique Mission guarantee, that Mission products will outperform any other products, is the big reason that removes all chance. You get the best only from Mission; so get only Mission—genuine Mission with the name on them—pistons. Play it safe!

MISSION MANUFACTURING CO.

MISSION MANUFACTURING CO., P. O. Box 4209, Houston, Texas, cable address "MISSCO" • export office: 30 Rockefeller Plaza, New York In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • cable address "MISSOMAN"

69—600

MY CREWS DO A FASTER JOB with GUIBERSON SWABS

There's no substitute for a fast-falling, smooth-pulling Guiberson swab in speeding-up swabbing operations. Crews make fewer trips .. do a better clean-out job .. lift more fluid per hour. So naturally they're in and out quicker .. at the *lowest possible* swabbing cost. Match one of these cups to your swabbing job.

TYPE J .. lifts heaviest loads

TYPE L .. lifts medium or light loads

TYPE GW .. for light loads

TYPE K .. general purpose cup to 6,000 feet

SIMPLEX .. lifts fluid containing suspended sand

More than a third of a century of swab-making experience is behind each Guiberson swab and cup. No matter what type of production .. shallow or deep .. light or heavy loads .. smooth, rough or tight tubing .. you will pull more fluid with Guiberson swabs and cups. Regardless of your swabbing problem, you can meet it .. solve it .. quicker and cheaper with a Guiberson swab.

Cups are compounded to Guiberson's exclusive formulas for maximum resistance to oil .. acid .. abrasion.

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by Oil Field Supply Stores Everywhere

can initiate steps to prevent further erosion of our capital. We can take stock of conditions and, if we want to continue, we will just have to have more compensation for our work."

W. L. McClusky, 1960 president, American Association of Oilwell Drilling Contractors, in a speech at the association's annual meeting.

They need each other

"The fact is that 98% of all business organizations in America employ 50 people or less.

"Of the remaining 2%, only a fraction could be considered 'big business.' This fraction frequently is the subject of a widespread misconception: that it, big business, tries to smother and stamp out little business whenever and however it can.

"The fact is that the small businesses of the nation are vitally important to the large ones. Purchases of a typically large corporation in a given year include a vast amount of products and services supplied by small businesses—as small, often, as the neighborhood stationery store.

"Far from wanting to take over small businesses, big business often takes pains to keep them operating—as insurance of economical, steady sources of supply. Big and small business are mutually dependent, not mutually antagonistic.

"Small business is a relative thing. A 'small' purchase by a big company may be the largest sale on the small company's books.

"Wherever there is big business, there is small business supplying it and benefiting from the relationship."

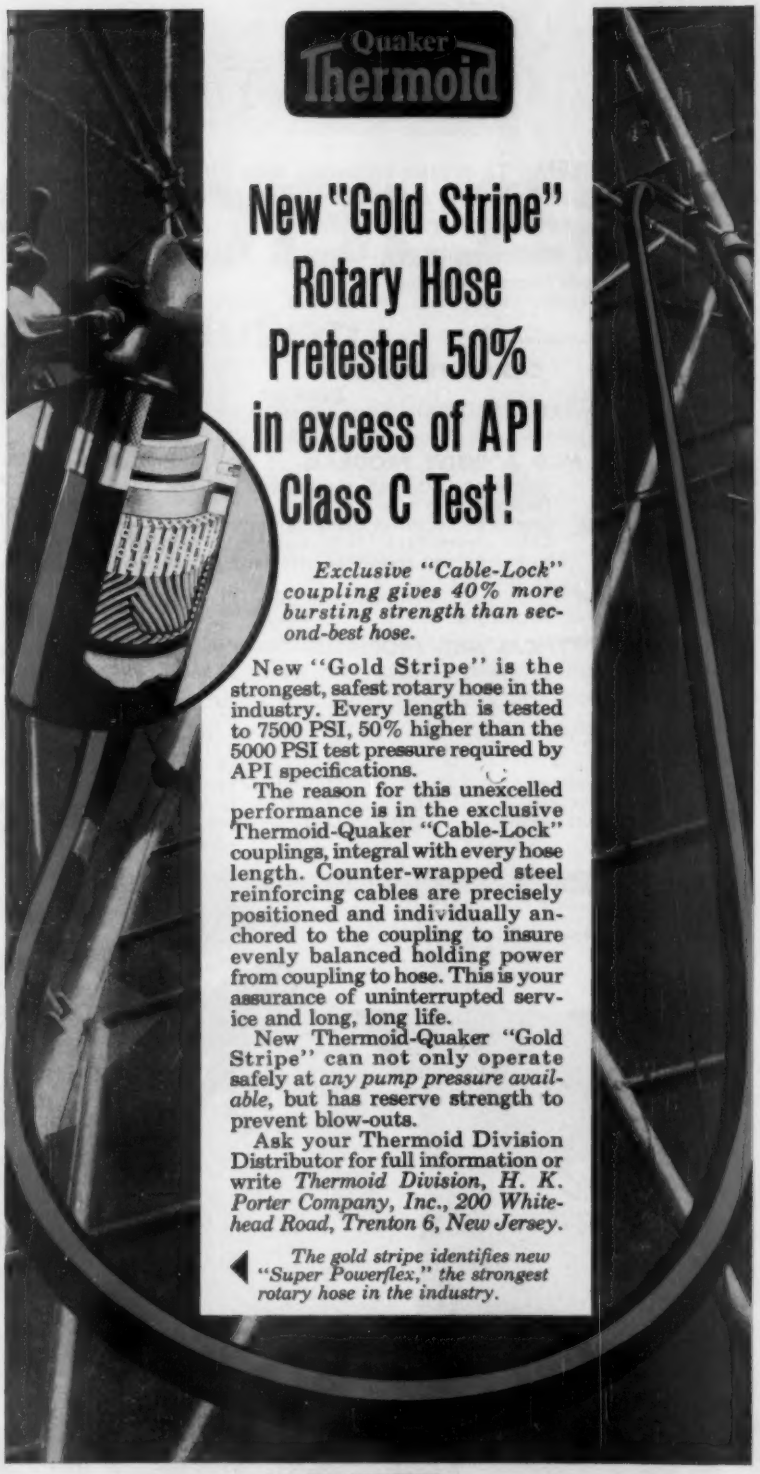
Article in the Texaco Star, magazine of Texaco Inc.

The mink tax bracket

"State and federal gasoline taxes across the nation currently average 10 cents a gallon—or $1 for every 10 gallons of motor fuel. That is a sales tax amounting to nearly half of the basic retail price (before tax) of gasoline—a sales tax that is five times as high as the tax on diamonds, mink coats, and similar luxuries.

"Such excessive taxation tends to obscure the fact that gasoline is one of the most economical commodities available to the American consuming public. Except for the taxes, the current prices on regular gasoline are about the same as in 1926 and lower than in some post-World War II years.

"While the cost of living has increased 21% during the past 10 years, the retail price of gasoline before taxes has gone up only 5½%. Mean-


Quaker
Thermoid
New "Gold Stripe" Rotary Hose Pretested 50% in excess of API Class C Test!
Exclusive "Cable-Lock" coupling gives 40% more bursting strength than second-best hose.
New "Gold Stripe" is the strongest, safest rotary hose in the industry. Every length is tested to 7500 PSI, 50% higher than the 5000 PSI test pressure required by API specifications.
The reason for this unexcelled performance is in the exclusive Thermoid-Quaker "Cable-Lock" couplings, integral with every hose length. Counter-wrapped steel reinforcing cables are precisely positioned and individually anchored to the coupling to insure evenly balanced holding power from coupling to hose. This is your assurance of uninterrupted service and long, long life.
New Thermoid-Quaker "Gold Stripe" can not only operate safely at any pump pressure available, but has reserve strength to prevent blow-outs.
Ask your Thermoid Division Distributor for full information or write Thermoid Division, H. K. Porter Company, Inc., 200 Whitehead Road, Trenton 6, New Jersey.
The gold stripe identifies new "Super Powerflex," the strongest rotary hose in the industry.

THERMOID PORTER DIVISION

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

You save drilling dollars with

THE

MUD PROBLEM: To protect formation from filtrate water damage and alleviate the two conditions of out-of-gauge bits and enlarged hole.

WELL DATA

Location: Sublette County, Wyoming
Total Depth: 11,564′. Hole from 506′ to T.D. drilled with 7⅞″ bits
Bottom Hole Temperature: 137°

CASING PROGRAM

Size Inches O.D.	*Depth Set Feet*
13⅜″ casing	506

MUD ADDITIVE PROGRAM

0′ to 9,323′	AQUAGEL*, TANNEX*, caustic soda and HV DRISCOSE†.
9,323′	Converted to invert emulsion made up of 60% diesel fuel, 40% water, 20 ppb INVERMUL* and BAROID* to give mud weight of 10.0 ppg.
9,323′ to 11,564′	INVERMUL invert emulsion plus 13. ppb PETROTONE**.

TYPICAL MUD PROPERTIES

Depth, feet	9,000	9,323	10,130	11,564
Weight, ppg	10.0	10.0	10.0	10.4
Viscosity, cps	45	100	123	87
Stormer Gel, 10 min	2	8	2	2
Filtrate, cc API	6.0	0	0	0.3(oil)
Oil, % by volume		50	46	49
Water, % by volume		44	46	41
Solids, % by volume	6	6	8	10
Electrical Stability, volts		200	230	280

*Registered Trademark of Baroid Division National Lead Company
**Trademark of Baroid Division National Lead Company
†Registered Trademark of Drilling Specialties Company

DISCUSSION: INVERMUL mud was used to protect the Mesa Verde section from damage by water filtrate and to alleviate the two conditions of out-of-gauge bits and enlarged hole.

SOLUTION: Invert emulsion mud, made with INVERMUL, was selected not only because API filtration could be reduced to zero but also because of its high tolerance for contaminating water base mud that would become mixed with it during displacement. Additional INVERMUL mud can be easily mixed at the rig with rig equipment and the mud properties can be easily controlled or modified.

During displacement an estimated 400 bbl of water base mud remained in the sections of washed out hole and later became mixed with the INVERMUL mud causing some API filtration and settling of solids. API filtration was reduced to zero by adding 5% diesel oil and 5 ppb INVERMUL. Settling was eliminated by adding 1.3 ppb PETROTONE, a product specifically developed by Baroid for imparting suspending properties to invert emulsions and oil base muds. No out-of-gauge bits or worn out bit bearings were reported.

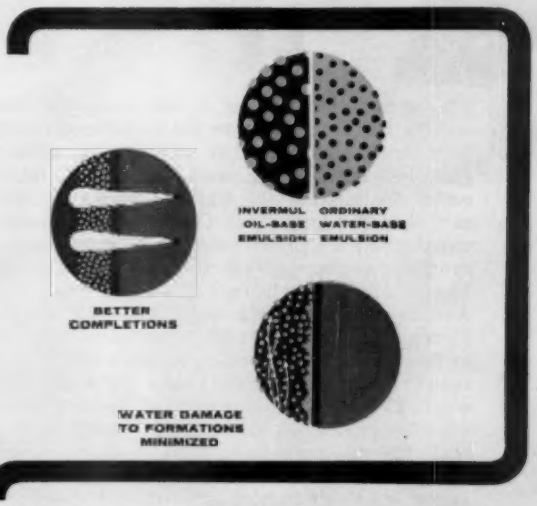
a Baroid Mud Program

MUD PROBLEM

...and its solution

This case history demonstrates again how Baroid provides the right combination of mud products to solve drilling difficulties. In this instance the problems associated with drilling in a long section of open hole (11,058′) were: prevention of water filtrate to the formation, reduction of hole enlargement, and elimination of reaming due to out-of-gauge bits. These problems were solved by selecting INVERMUL oil base emulsion mud. The high tolerance of INVERMUL mud to contaminating water base mud proved to be a definite advantage. Approximately 400 bbl of water base mud from enlarged sections of the hole, became mixed with the INVERMUL mud. The resultant settling of solids and filtration increase were quickly corrected by adding INVERMUL, oil and PETROTONE.

Successes such as this are made possible by Baroid's integrated program that quickly brings specialized products and engineering skill to solve your mud problems.

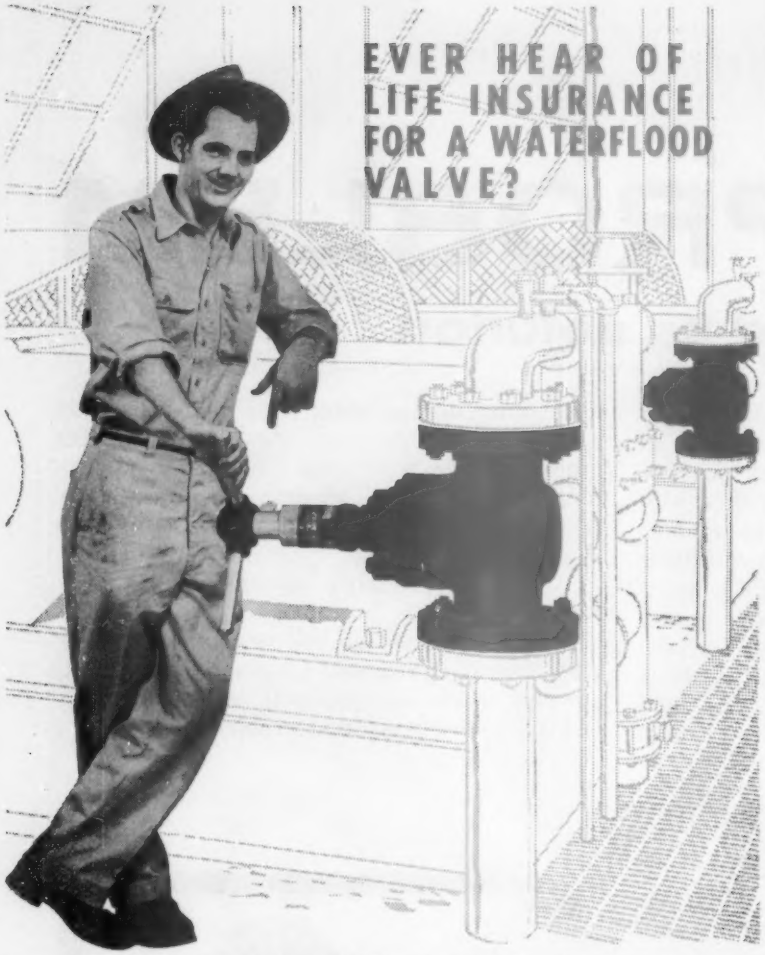


BAROID

BAROID DIVISION NATIONAL LEAD COMPANY

MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

6029



Maybe not—but you *get* it, automatically, when you specify the Demco Valve for waterflood operations! Because Demco's unique design and construction give you *built-in insurance* for longer, troublefree valve life against the highly-corrosive qualities of salt waterflooding. With Demco's high-pressure gate valve, you get a positive rubber-to-metal seal—tough synthetic rubber against corrosion-resistant stainless, Monel, aluminum bronze or ductile iron.

And the Demco Valve seals drop-tight without applying undue torque to the stem! The body remains in line while the entire inner assembly lifts out for easier, faster inspection. Fewer parts are subject to wear. Design allows constant self-lubrication of stem threads, protection from abrasives by *double* stem seal.

Countless troublefree installations have proved this versatile valve's rugged performance under the most difficult waterflood conditions. Why not let the Demco Valve's "life insurance" work for you, too?

Available at supply stores everywhere in 1,000, 2,000, 3,000 and 5,000 psi working pressures . . . in two-to four-inch sizes.

DRILLING EQUIPMENT MANUFACTURING CO.

845 S. E. 29th Street • OKLAHOMA CITY

while, the combined federal and state gasoline taxes have risen 51%.

"Trial balloons are aloft already, seeking to extend the most recent 'temporary' federal tax—or even attaching another half cent to it.

"Meanwhile, motorists have become price conscious and economy minded. Indications are that 'economy' cars will account for a much larger share of the automobile market next year than ever before. Gasoline taxes have unquestionably reached or passed the point of diminishing returns for the tax collectors."

Article in the Humble Way, magazine of Humble Oil & Refining Co.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

OCTOBER

17-18 University of Houston, American Society of Tool and Manufacturing Engineers, symposium on the field of numerical control, Oberholtzer Hall, University of Houston, Houston.

17-19 American Society of Mechanical Engineers, American Society of Lubrication Engineers, lubrication conference, Statler Hilton Hotel, Boston.

17-19 University of Minnesota, Pennsylvania State University, Colorado School of Mines, biannual symposium on drilling and blasting, Golden, Colo.

17-Nov. 5 University of Oklahoma, School of Petroleum Engineering, short course in advanced drilling practices for engineers, University of Oklahoma, Norman.

19-20 National Association of Corrosion Engineers, north central region conference, Schroeder Hotel, Milwaukee.

19-21 Gulf Coast Association of Geological Societies, convention, Biloxi, Miss.

19-21 Rocky Mountain Oil and Gas Association, annual convention, Brown Palace Hotel, Denver.

20-21 American Institute of Mining, Metallurgical, and Petroleum Engineers, Los Angeles Basin, fall meeting, Huntington Sheraton Hotel, Pasadena, Calif.

20-23 Permian Basin Oil Show, Odessa, Tex.

21 Southern Gas Association, roundtable conference on pipeline operations and maintenance, Lamar Hotel, Houston.

23-25 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

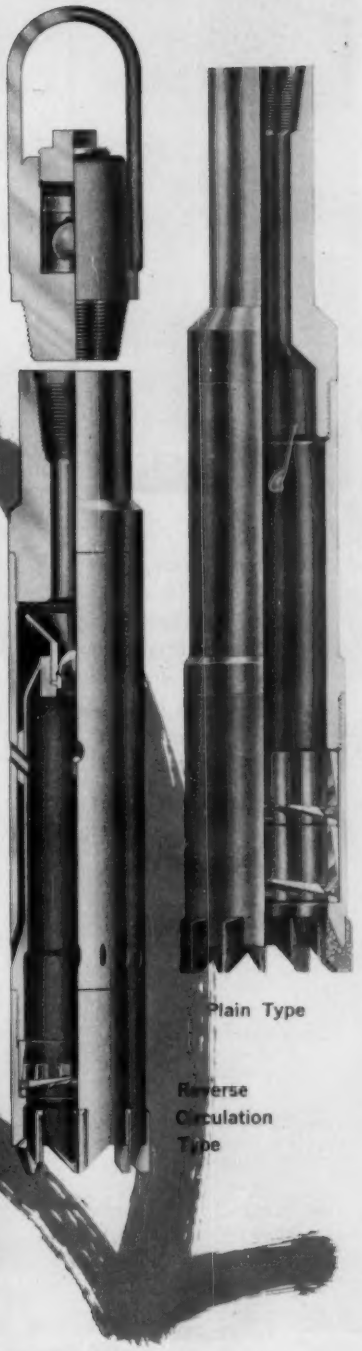
24-25 American Society of Mechanical Engineers, American Institute of Electrical Engineers, fuels conference, Daniel Boone Hotel, Charleston, W. Va.

25-28 National Association of Corrosion Engineers, south central region conference, Mayo Hotel, Tulsa.

26-27 Armour Research Foundation of Illi-

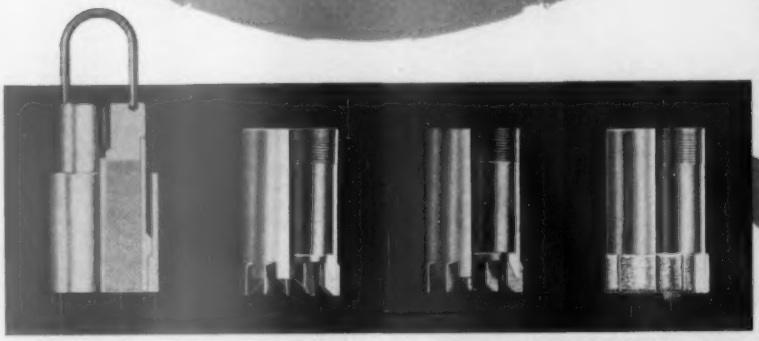
only BOWEN gives you a CHOICE

Only from Bowen can you **get the Junk Baskets and Accessories most suited to your particular needs!** The Plain Type has an outstanding two-catcher retrieving combination, ideal for either fishing or coring. The Reverse Circulation Type, with its unique construction, washes all debris up off bottom and directs it into the basket, insuring complete recovery of all junk. Accessories are available for all Bowen Junk Baskets that make them the most versatile of all such tools . . . type A, B, and C Mill Shoes for milling and cutting cores . . . Magnet Inserts to convert the baskets into effective Fishing Magnets. You want the best . . . insist on Bowen Junk Baskets! Send for complete information.



Plain Type

Reverse Circulation Type



Magnet Inserts Type "A" Mill Shoe Type "B" Mill Shoe Type "C" Mill Shoe

For over 25 years—the world's leading manufacturer of fishing and specialty tools.

BOWEN ITCO, INC.

P. O. Box 4587
Houston 13, Texas, U.S.A.
Cable Address: ITCO

BOWEN

25th ANNIVERSARY 1935 1960

Combine your Couplings, Welding Fittings, Flanges, Swage Nipples and Bull Plugs, Pup Joints, Sub Nipples, Sub Couplings, Weld Reducers, Caps and Saddles on one purchase order and take advantage of prepaid freight or freight allowance. Freight prepaid on combined shipments of 500 lbs. or more of the above items to one destination.

For this kind of service and savings, send all your orders to
HENRY H. PARIS DISTRIBUTOR, INC.

DISTRIBUTOR FOR THE FOLLOWING PRODUCTS:

ALTEN FOUNDRY & MACHINE WORKS
Lancaster, Ohio
Lubricated Plug Valves and Cocks.

DRESSER MANUFACTURING DIV.
Bradford, Pa.
Seamless Welding Fittings, Couplings and Sleeves.

THE FAIRBANKS COMPANY
Binghamton, N. Y.
Bronze and Iron Valves.

THE GORMAN RUPP COMPANY
Mansfield, Ohio
Centrifugal Pumps.

HARRISBURG STEEL COMPANY
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Casing Couplings.

LOS ANGELES BOILER WORKS, INC.
Los Angeles, Calif.
Welding Caps—Dished & Flanged Heads.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

STEEL FORGINGS, INC.
Shreveport, La.
Weld Saddles.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels. Prevents spillage—easily loaded.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

HENRY H. PARIS DISTRIBUTOR, Inc.
OIL WELL. REFINERY AND INDUSTRIAL SUPPLIES
1125 ROTHWELL ST. • P. O. BOX 932 • HOUSTON, TEXAS

nois Institute of Technology, computer applications symposium, Morrison Hotel, Chicago.

26-27 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

28 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

28 American Institute of Chemical Engineers, South Texas section annual technical meeting, Rice Hotel, Houston.

31-Nov. 4 University of Oklahoma, petroleum landmen's institute, Student Union Building, University of Oklahoma, Norman.

NOVEMBER

3 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

3-4 American Association of Petroleum Geologists, Pacific section, annual meeting, Ambassador Hotel, Los Angeles.

3-4 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-9 Chemical Institute of Canada, chemical engineering division, conference, Quebec City.

7-10 Society of Exploration Geophysicists, international meeting, Moody Convention Center, Galveston, Tex.

14-16 American Petroleum Institute, fortieth annual meeting, Conrad Hilton, Palmer House and Congress hotels, Chicago.

14-16 Society of Petroleum Engineers of AIME, Venezuelan sections, fourth annual meeting, Maracaibo, Venezuela.

15-16 University of Kansas, natural-gas pipeline institute, Courthouse, Liberal, Kans.

15-16 Purdue University, symposium on engineering applications of random function theory and probability, West Lafayette, Ind.

15-17 Southwest Research Institute, Air Force, Navy, industry propulsion systems lubricants conference, Hilton Hotel, San Antonio, Tex.

18 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

18-20 Roswell, N. M., Geological Society, field trip, San Andres and North Franklin Mountains, registration November 17, Las Cruces, N. M.

20-22 Fluid Controls Institute, Inc., fall meeting, Drake Hotel, Chicago.

22 Manufacturing Chemists' Association, tenth semiannual meeting and midyear conference, Statler Hilton Hotel, New York City.

27-Dec. 2 American Society of Mechanical Engineers, winter annual meeting, Statler Hilton Hotel, New York.

DECEMBER

1-3 American Chemical Society, southwest regional meeting, Biltmore Hotel, Oklahoma City.

4-7 American Institute of Chemical Engineers, meeting, Statler Hotel, Washington.

5-7 Interstate Oil Compact Commission, annual meeting, Westward Ho Hotel, Phoenix.

9 Tulane University, School of Law, and American Association of Oilwell Drilling Contractors, fifth annual program on mineral and tidelands

WHEN CASING MUST BE CENTERED

THE LARKIN DOUBLE BOW DOES IT BEST

• FIG. 905 LONG LOK-ON

Highest centering strength • Lowest permanent set • Five ranges for easy starting and maximum efficiency in any casing/hole size combination • Available . . . "Through Your Supply Store."

LARKIN PACKER COMPANY

DIVISION KOEHRING COMPANY

WAXAHACHIE, TEXAS

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

LARKIN

...Through Your Supply Store

and now patented

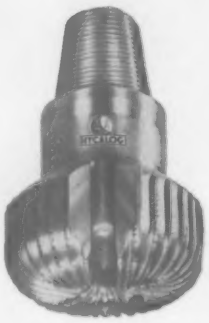
Developed by Hycalog . . .

V-DOOR DRILL BITS

PATENT PENDING
U. S. Patent No. 2,931,630

CORE AND BUST TO ACHIEVE LONG UNINTERRUPTED RUNS

HYCALOG

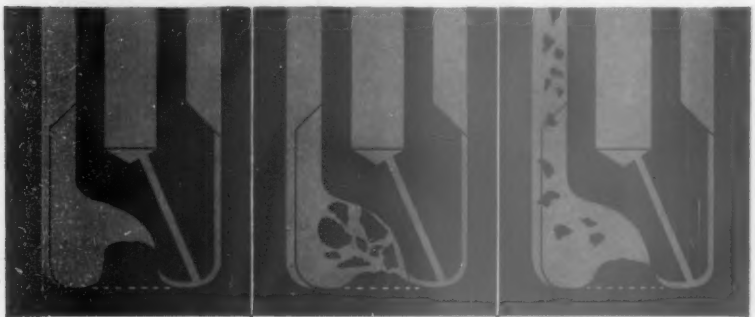


Diamond drill bits were formerly handicapped in duration of runs . . . *and rate of penetration* . . . by their inability to dispose of cores formed at their centers.

In shales and other soft formations, the core twisted off and rotated with the bit.

In hard sands the core crushed the center diamonds, preventing further drilling.

BUT HYCALOG'S ENGINEERS have turned these handicaps into an advantage. Now, the V-DOOR bit, developed by HYCALOG, utilizes *controlled failing* of cores to achieve a faster rate of penetration . . . *and longer life*. HERE'S HOW:



The diamond surfaced center hole purposely cuts a cylindrical core. Valve action of core against bit reduces escape of fluid through the V-DOOR . . . forces it over the cutting surfaces keeping them thoroughly flushed.

Combination of bit design and hydraulic pressure breaks core into short segments. Then valve action is momentarily interrupted; high pressure fluid is released with a surge into V-DOOR port, forcing core fragments into discharge port.

Core fragments are flushed out of hole. With every revolution, the V-DOOR port sweeps bottom of the hole removing loose small particles, and eliminating necessity of regrinding.

Ask your HYCALOG rep to show you some performance records on the V-DOOR. He has a stack of them. *And also get the facts on* HYCALOG *well logging.*

Hycalog, Inc.

505 AERO DRIVE
SHREVEPORT, LOUISIANA

BRANCH OFFICES IN PRINCIPAL OIL PRODUCING AREAS

DIAMOND CORING • DIAMOND BITS • WELL LOGGING • CORE ANALYSIS

law, University Center, Tulane University, New Orleans.

26-31 American Association for the Advancement of Science, annual meeting, New York City.

JANUARY

15-18 Pipe Line Contractors Association, annual meeting, Mark Hopkins and Fairmont Hotels, San Francisco.

16-19 Instrument Society of America, winter instrument-automation conference and exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis.

17-19 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

20 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

FEBRUARY

7-8 University of Oklahoma, School of Petroleum Engineering, advanced petroleum engineer seminar, University of Oklahoma, Norman.

18 Purdue University, business history conference, "Management Decisions Under Government Regulation," Memorial Union, Purdue University, Lafayette, Ind.

24 Natural Gasoline Association of America, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette, La.

26-Mar. 1 American Institute of Chemical Engineers, petrochemical and refining exposition, Municipal Auditorium, New Orleans.

26-Mar. 2 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Chase and Park Plaza Hotels, St. Louis.

MARCH

7-8 University of Oklahoma, School of Geological Engineering, seventh biennial geological symposium, Student Union Building, University of Oklahoma, Norman.

8-10 American Petroleum Institute, Division of Production, southern district meeting, Captain Shreve and Washington-Youree hotels, Shreveport, La.

13-17 National Association of Corrosion Engineers, annual meeting and corrosion show, Hotel Statler, Buffalo, N. Y.

15-17 Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas.

22-24 American Petroleum Institute, Division of Production, southwestern district meeting, Cole Hotel, Albuquerque.

23 National Industrial Conference Board, general session, Shamrock-Hilton Hotel, Houston.

27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.

28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

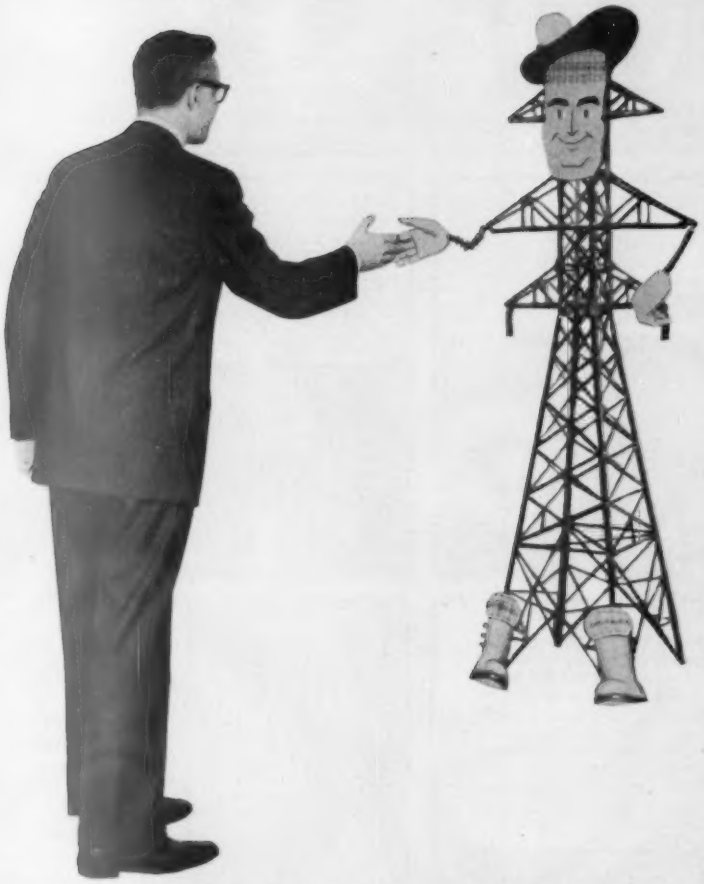
5-7 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.

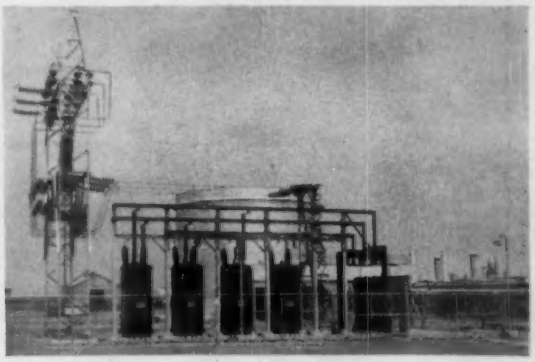
9-12 Western Petroleum Refiners Association, annual meeting, San Antonio, Tex.

Memo to Management:

STOP WASTE...
with efficient power



The increasing availability of utility electric power has made it more and more useful in the current drive to stop waste of time, money, and manpower. The many economies of utility electric power have made it the ideal solution to problems in pumping, waterflooding, gathering, transmission as well as refining. For the latest facts on purchased electric power, consult your Utility Electric Power Company.

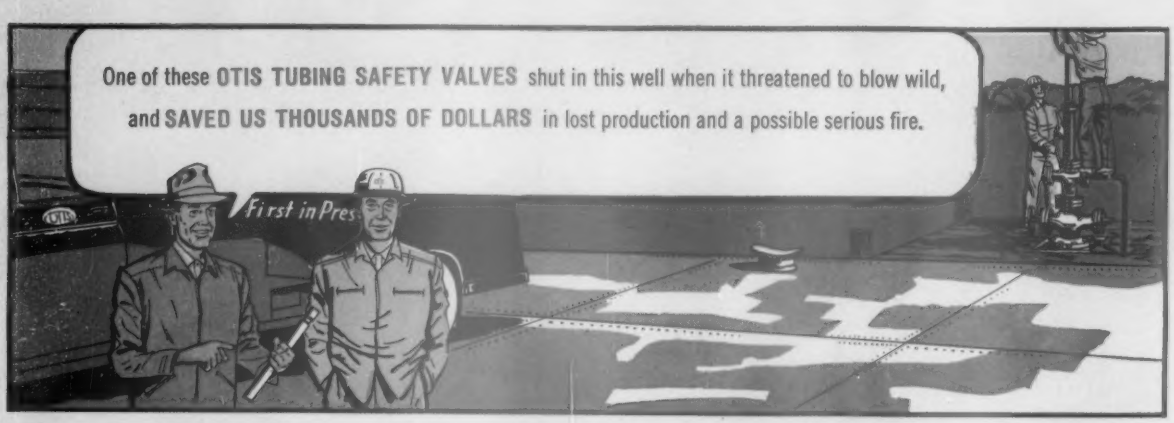


PETROLEUM ELECTRIC
POWER ASSOCIATION

BOX 35006, DALLAS 35, TEXAS

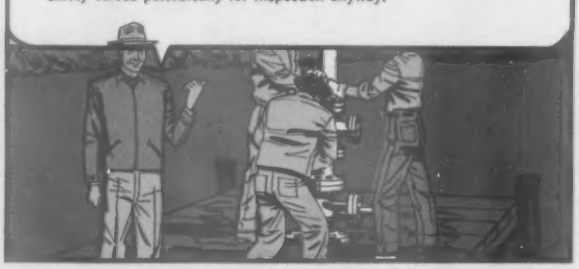
A list of P.E.P.A. members will be furnished on request.

One of these **OTIS TUBING SAFETY VALVES** shut in this well when it threatened to blow wild, and **SAVED US THOUSANDS OF DOLLARS** in lost production and a possible serious fire.

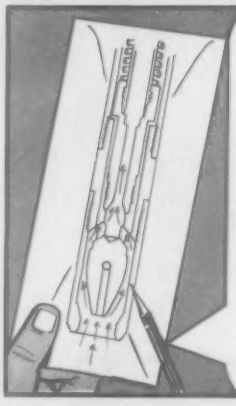


The well was producing 2½ M.M.C.F.D. of gas with 89 B.D. of sand-laden oil when a leak developed at the flange of the master valve. At the time, the flowing pressure was 3,100 P.S.I., so it didn't take long for the gas and sand to cut out a sizable hole. As soon as the pressure differential exceeded the setting of the Otis Storm Choke®, it automatically snapped shut.

This morning we pumped down through the safety valve and killed the well with water—then broke out the master valve to repair the leaky connection. Now we're resetting the tree. We called out Otis to pull, check, and redress the safety valve before we put the well back on production. The valve's probably O.K., but it's been down there 10 months and under our safety program we pull all of our safety valves periodically for inspection anyway.



We just pulled the Storm Choke from this well and, although it has had heavily sand-laden fluid produced through it for the past 10 months, the bean is hardly flow-cut. The valve is one of our Type F valves, which we originally set for this customer. We've replaced the bean, redressed the valve, checked the setting, and are in the process of rerunning it. Our Type F valve is a spring-loaded valve that snaps closed when pressure, created by an increased flow through the valve, exceeds the compression setting of the valve spring.



In the opened position, flow through the valve follows a single, straight course. The valve is designed so that the sealing surfaces of the valve, and the valve seat, are out of the direct line of flow to minimize possible cutting action of the fluid. Although our tubing safety valves are pressure-differentially-operated, they will not close prematurely due to surging heads—and they can be adjusted to operate dependably within a very close range.

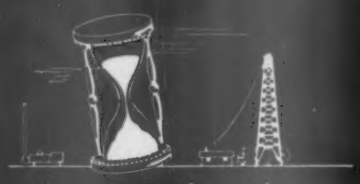
Otis Tubing Safety Valves, or Storm Chokes as they've been called for years, can be run in and landed under pressure in Otis nipples made up in the tubing string, or set in the tubing on slips for wells without nipples. OTIS TUBING SAFETY VALVES, SET BY OTIS CREWS, HAVE NEVER FAILED TO SHUT IN A BLOWOUT. Call the Otis office nearest you and talk to them about installing tubing safety valves—before you need them. A small investment in an Otis Storm Choke today can protect you against a possible fire or wild well tomorrow. PLAY IT SAFE WITH A SAFETY PROGRAM—CALL OTIS!

OTIS—"First in Pressure Control"

OTIS ENGINEERING CORPORATION

General Offices: 6612 Denton Drive · Dallas

Branches Throughout the Oil Country



the Journal said...

50 years ago

October 20, 1910

Mexico's biggest oil deal was closed this week with the purchase by Waters Pierce Oil Co. of 2,500,000 bbl. of crude petroleum from Mexican Petroleum Co.'s Huasteca property, near Tampico. Purchase price is equivalent to 82½ cents per barrel in United States money. Minimum gravity of the crude is to be 14°. Deliveries begin immediately.

Prairie Oil & Gas Co. pays $1,000,000 for oil properties embracing more than 28,000 acres in its purchase of a group of leading Oklahoma independent producing companies owned chiefly by A. T. Francher, of New York. American Oil & Gas Co., National Oil & Gas Co., Iroquois Oil & Gas Co., Seneca Oil & Gas Co., and Western Oil Co. comprise the group. Their properties extend across the Osage reservation into Washington County. They represent one of Oklahoma's largest group ownerships.

25 years ago

October 17, 1935

First oil production in southwestern Colorado is indicated in a rank wildcat drilled by the William E. Hughes estate in the Price district of Archuleta County. The prospective discovery well swabbed 110 bbl. of oil in 5 hours from Dakota sand at total depth of 1,090 ft.

Major oil boom develops in newly discovered Rodessa field, north of Shreveport, in northwestern Louisiana. Two additional prolific oil producers and one large gasser completed during week boost total wells to date to seven. Active drilling operations raised to 14 with 17 new locations. Play spreads westward into Cass County, East Texas.

Anglo-American oil companies plan purchase of all Russian oil supplies in excess of domestic requirements as possible means of bringing about more stable foreign operations.

10 years ago

October 19, 1950

Newly formed Petroleum Administra-

Navy Department reports bringing in of first good productive well in 6 years of exploration of its Alaskan Naval Petroleum Reserve No. 4. Flow of 500 bbl. daily of 37°-gravity oil is recorded during short open-flow test.

Old Standard Oil Building at 26 Broadway in New York, famous in the oil business since its construction 65 years ago, is renamed after Socony-Vacuum Oil Co., Inc., its present occupant. Former name called a misnomer since merger of Standard Oil Co. of New York and Vacuum Oil Co. in 1931.

JOURNALLY SPEAKING

The Hurricane

WELL SIR, we went down to the INGAA convention in Miami Beach which was held right after the hurricane struck, and you never saw such confusion in your life.

We're not talking about Hurricane Donna; that was just some unusual Florida weather. We mean Hurricane FPC—the Phillips decision and the statement of policy on how producers' gas prices are going to be set. That was a real twister.

The storm struck without warning 3 days before the meeting opened. Most of the delegates were already on their way there and didn't have time to study the FPC documents, so it was a mighty confused lot of folks who milled around among the ornate surroundings of that Gold Coast luxury hotel.

There were people there from every aspect of the gas business: producers, pipeliners, distributors, lawyers, economists, consultants, and—perhaps significantly—an unusually large contingent of bankers and investment counsel. They all buzzed around like a hive of queenless bees asking each other questions about the new FPC plan, but they might as well have stayed home because nobody had any answers.

A hurricane, you know, goes in circles. First it blows in one direction and then in the other, and in between there is a period of dead silence and inactivity. That's the way it was at this INGAA meeting. Some people were blowing one way, some the other, and some were just standing dumbly in the "dead eye" waiting to see which way the wind was going to blow next.

Just as Hurricane Donna had knocked down just about all the signs in Florida, Hurricane FPC had knocked down just about all the signs in the gas business. Nobody knew which direction to go or where to start picking up the pieces.

These gas men reminded us of the old story about the Irishman who fell down a well.

Mike rushed up to the well and yelled "Pat, are you killed?"

"No," said Pat, "I'm not killed but I'm knocked speechless."

The gas people weren't dead, but they certainly were knocked speechless. Even the lawyers couldn't say anything.

Our personal conclusion is that the gas people should take the same optimistic attitude toward Hurricane FPC as the Florida real estate men are taking toward Hurricane Donna. They say Donna cleared away a lot of dead trees, decrepit shacks, jerry-built housing, and obsolete structures, and that as soon as they get the debris out of sight the whole state will be in better shape than before.

In like manner Hurricane FPC swept away a lot of shoddy and unsound ideas about gas prices and their regulation. The rebuilding task may look pretty formidable at the moment, but building sound new structures should be a lot more satisfactory than trying to patch and prop the shaky ones that disappeared in the big blow.

For example, just one of the things FPC swept away is the notion that gas prices were exorbitant under private competitive enterprise before regulation and that utility-type control would bring them down.

In plain words FPC said that in almost all instances gas is substantially underpriced, that the old contracts were fair or more than fair to consumers, and that regulation of the sort it has been trying for 6 years will result in higher prices, not lower.

Now we submit that it's really something when a federal regulatory bureau publicly admits that its regulation is a complete flop and that private enterprise can do better, that businessmen can run their business better than bureaucrats.

That's typical of hurricanes—first they blow one way, and then just the opposite. For 6 years FPC blew in the direction of strict control and now it's blowing directly against it.

It looks to us as though FPC is blowing in the right direction at last. They say it's an ill wind that blows nobody good, and Hurricane FPC now seems to be headed in a way that will blow a lot of people a lot of good.

—Henry D. Ralph

TUBINGLESS COMPLETIONS

Baker has developed a complete new line of products for completions using tubing as small-diameter casing.

The picture shows some of these new products. The complete line very nearly parallels the entire Baker line of conventional-size products.

The line includes: Primary Cementing Equipment (shoes, collars, centralizers, scratchers, turbulizers); Remedial and Stimulation Tools (treating packers; both retrievable and drillable bridge plugs); Production Tools (retrievable and drillable production packers; casing pump packers, tubing anchors).

Many of these new Baker Products are not yet available in quantity, nor in all areas.

Tubingless Completions are becoming more numerous. Our own engineering and development programs continue as Baker keeps alert to the trends—ready to provide the practical and dependable new tools that will further improve tubingless completion methods and techniques.

WE INVITE YOUR INQUIRIES
Please ask your Baker Man for Technical Bulletin 378, or write to Baker Oil Tools, Inc., Box 2274, Terminal Annex, Los Angeles 54, California

BAKER

BAKER OIL TOOLS, INC. / HOUSTON / LOS ANGELES / NEW YORK

This time gas producers should run with the ball

THE FEDERAL POWER COMMISSION needs a lot of help in its new plan to determine what gas prices will meet the financial needs of the industry in maintaining supply.

How much help producers give depends on how much they have learned about governmental processes since 1954.

At the moment many producers are reacting much as they did to the Supreme Court's Phillips decision. They are stunned at the change in direction, frustrated by the lack of specific guides, and inclined to conclude that the thing just can't be made to work.

IN 1954 FPC ASKED all interested parties for suggestions on how to regulate producers' prices.

Producers said only that "it can't be done." They offered no suggestions except reliance on arms'-length bargaining.

But one group of distributors offered a plan which, in general outline, was strikingly similar to FPC's new policy. It endorsed all objections to the rate-base method which producers were raising (and which FPC has now confirmed), and urged area prices high enough to encourage exploration.

That suggestion got lost in the bitter fight between producers who insisted that nothing be tried and distributors who insisted that the cost-of-service method be tried. If producers had leaned toward the area approach then, FPC might now have had some 5 years of experience with it.

Now FPC is starting anew to grope toward standards and procedures for determining just and reasonable field prices. And again it is asking for practical assistance from all concerned.

This is a challenge to producers. FPC has tossed the ball in the air and they have a chance to grab it and run in the right direction while the cost-formula advocates are still bewildered.

Things will be a mess for a while. The pricing standards mentioned by FPC are vague and need much amplification. Entirely new types of economic evidence must be gathered and presented. New hearing procedures must be developed to keep the administrative machinery from bogging down.

IF PRODUCERS AGAIN take the intransigent attitude that there is no use trying anything other than complete freedom from regulation, FPC may again fall under the influence of legalists and theorists who don't understand the producing business.

Maybe the FPC plan is unworkable. If producers drag their feet it will take another 5 years to find that out. It would be smart to cooperate in giving the plan a fast and fair trial.

At last FPC is trying to talk producers' language. It needs help in developing that vocabulary and in teaching it to courts, consumers, and eventually to Congress.

When a specialist is needed ....

INTERNATIONAL answers the call with the 230 Series!

Specialization is one key to the success of the INTERNATIONAL 230 Series Trucks. From drawing board through the manufacturing line, INTERNATIONAL has built these trucks to tackle the biggest loads . . . to keep your off-highway operation on the go.

Extra-heavy components, like deck-plate fenders, ward off heavy brush while getting into location. Six-wheel models save time, reduce bog-down and slow-down problems by providing maximum flotation, favorable ground clearance and superior traction. What's more, these heavy-duty units are engineered with a drive line that matches engine, truck and load weights exactly.

Available with V-8's or 6's (gasoline and LPG), or with diesel engines up to 262 hp., these trucks can pull through the roughest going. They are capable of handling gross combination loads in excess of 125,000 lbs., while they maneuver easily through any terrain thanks to true geometric power steering that's standard equipment. With GVW ratings up to 73,000 lbs. and front and rear axles rated up to 18,000 and 55,000 lbs. respectively, INTERNATIONAL 230 models are big and brawny enough to lick any field assignment.

Get all the important facts from your INTERNATIONAL Truck Dealer or Branch oil field representative today. Let him help you get the right truck for your job—a truck that is quality built for solid dependability.

INTERNATIONAL® TRUCKS *World's Most Complete Line*

INTERNATIONAL HARVESTER COMPANY, CHICAGO • Motor Trucks • Crawler Tractors • Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

Clean jet fuel is essential to safe jet aircraft operation. Today, all aviation fuels in current service may be provided the ultimate protection against fuel contamination. The new Warner Lewis 2-stage separator/filter eliminates jet fuel contaminants — free water and dirt. This new equipment developed by Warner Lewis Company, pioneer manufacturer of separator and filter equipment for aviation fueling, delivers the cleanest fuel ever demanded by commercial or military aircraft.

A Silent Servant of Safety, this equipment is installed at the fixed facilities and on refueler trucks and hydrant carts serving most of the world's major airports. It is approved and in production for the U. S. Air Force under recent contracts. For further information, write Aviation Products division, Warner Lewis Company.

SILENT SERVANT OF SAFETY

WARNER LEWIS COMPANY
BOX 3096 • TULSA, OKLAHOMA

WARNER LEWIS EQUIPMENT PROTECTS THE JETS

DIVISION OF FRAM CORPORATION
IN CANADA: FRAM CANADA LTD., STRATFORD, ONTARIO

Drilling in '60 Should Hit New Goal

● Journal's midyear forecast of 45,451 completions for the year is now likely if last-half drilling continues to average over 800 wells a week.

OIL OPERATORS are slightly above target on their revised 1960 drilling program and should easily reach the 45,000-well year predicted at midyear.

Here's the rundown:

. . . **34,016 wells** were completed in the first 3 quarters.

. . . **11,435 wells** must be drilled in the last 13 weeks to reach the projected 45,451 wells.

. . . **An average of 800 wells** thus, must be maintained in the last quarter. With completions in the last 7 weeks averaging well above 900 wells, the goal appears easily attainable.

Reversal . . . Drilling activity this year has been an up-and-down affair featured by a sharp drop in completions the first quarter.

At the first of the year oil operators told The Oil and Gas Journal their drilling programs called for slightly more than 50,000 wells in 1960.

But these programs were changed sometime during the first half. This change showed up in reports to the Journal at midyear.

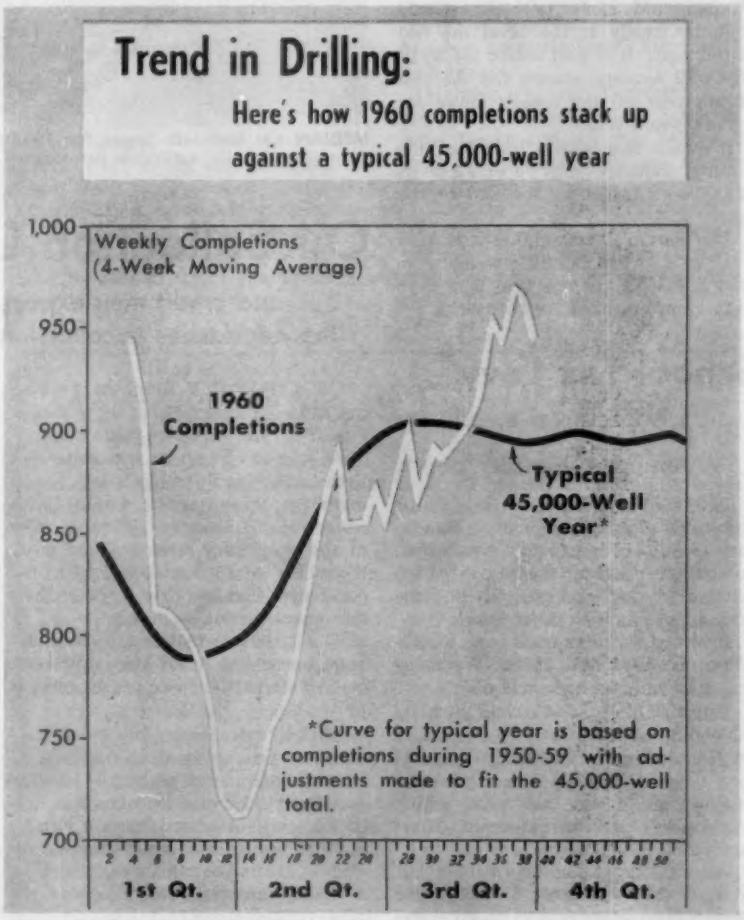
In the group of large companies, 63% of the operators cut drilling programs between the first of the year and July 1. If three nontypical companies are taken from the total group of large firms, the average downward adjustment for the others was 6.8%.

Reports from smaller operators, those who drill 50 wells or less per year, showed an even sharper revision. The average drilling program for all was cut 10.45%.

Based on these reported revisions, the Journal changed its forecast of drilling for the year from 50,789 wells to 45,451 which now appears to be the figure the industry actually will achieve.

How it stacks up . . . It is taking a strong second-half finish for the domestic drilling industry even to reach 45,000 wells, however.

The chart shows a comparison between actual completions so far this year and the seasonal distribution of completions for an average 45,000-well year.



The curve for the typical year was constructed from completion records for the 1950-59 period with a few of the peaks and valleys levelled out to give a smooth curve. The curve for the 10-year period had to be adjusted downward to fit the 45,000-well total.

The high completion rate for the first few weeks of the year can be traced to delayed completion work during the holiday season.

A drop in completions in late January and February is normal, but the steep decline experienced this year is much sharper than average. The decline hit bottom in the thirteenth week or the end of March, when completions averaged only 714 wells.

This low mark probably stemmed from the adjustments under the re-

vised drilling programs and was followed by the upturn generated by company decisions to resume drilling. The upturn was sharp enough to bring completions for the first half about in line with the level expected for a 45,000-well year.

By the end of the third quarter, operators had kicked up drilling work high enough that they were slightly ahead of schedule. A typical curve calls for 33,335 wells on this basis, and the total at end of third-quarter was 34,015. Thus, even though actual drilling for part of the year was below the typical mark, average for the year to date is slightly ahead.

Drilling has picked up in the late summer and early fall and should continue steady at this level the rest of the year. It is well above the 895,-900 well average shown for the rest of the year on the typical curve for a 45,000-well year.

It means that with a little luck the drilling industry may exceed its 45,000-well target by the end of the year.

The nation's last 45,000-well year was 1952 when 45,821 wells were completed. The record year was 1956 with completion of 58,160 wells.

School Tax Levy

. . . is declared invalid by Wyoming's highest court.

THE WYOMING Supreme Court has ruled unconstitutional a mandatory 5-mill property-tax law which compelled districts without high schools to pay expenses of students attending schools in other areas.

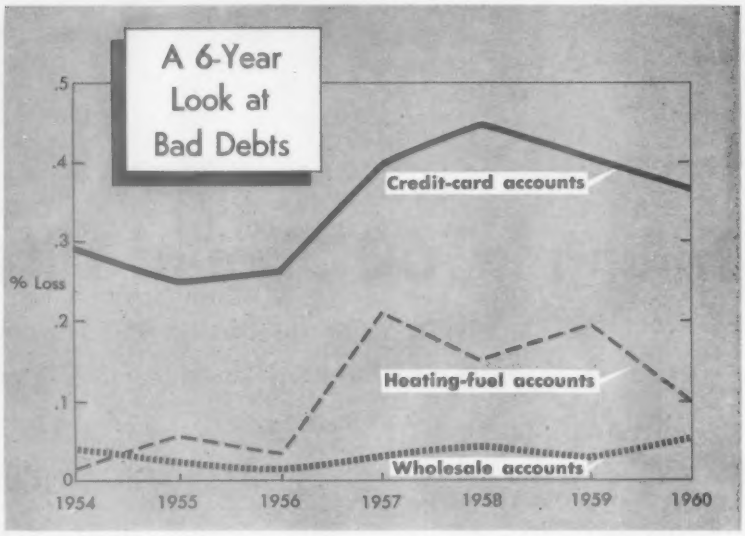
Involved was an appeal from Sweetwater County, one of 90 Wyoming counties without high schools.

Sinclair Oil & Gas Co. had attacked the validity of the 1959 tax measure in Sweetwater County. A district court at Green River had ruled the levy invalid, and it was this ruling which was upheld by the Supreme Court last week.

In attacking the levy, Sinclair charged that collecting a tax in one district for use in another district was illegal (OGJ, Dec. 28, 1959, p. 73).

Sinclair's assessed valuation in District 25, near Bairoil, is $13,375,580 of a total valuation of $13,551,555.

Of the $67,000 collectable from Sinclair under the tax law, only about $10,000 would have been needed to pay the actual cost of sending 11 high school students to classes at Rawlins. The remainder of the money would have been distributed to other school districts (OGJ, Sept. 19, p. 68 and OGJ, Mar. 21, p. 79).



MEDIAN net bad-debt losses for 1954-60 as reported by the Credit Economics Committee of the American Petroleum Credit Association.

Oil Collection Lag Worsens

. . . and credit men expect more trouble. The biggest of the headaches is collection of wholesale accounts.

OIL COMPANY suppliers are having a harder time getting their money out of certain types of customers.

A recent survey by the American Petroleum Credit Association found members having more trouble with wholesale oil accounts. Three-fourths of the companies reporting had more than 15% of such accounts past due; one-fourth had less than 70% of their customers paying on time.

The general situation on these accounts was the worst since the association started its twice-yearly surveys in 1953.

Median percentage of gross bad-debt loss was up again at mid-year to 0.045% compared with 0.041% for June of 1959, but considerable improvement is expected by year's end.

Heating-fuel accounts dropped to 40.6% at midyear, a 7-year low.

Credit managers, according to the survey, expect more trouble collecting from wholesale oil jobbers and distributors, retail dealers, industrial manufacturers, and road contractors.

They foresee little change in collection trends among credit-card accounts, which are turning over more slowly, and they expect fewer problems from farm accounts and federal, state, and municipal agencies in the last half of 1960.

Emphasis has switched from concern with farm-account collections to dealer accounts. Several companies are watching competitive conditions and managerial ability more closely in evaluating credit risk. Road contractors also are under close scrutiny.

Credit-card trends . . . The median number of calendar days' sales outstanding for credit-card accounts on June 30 was 48.5 days, down slightly from the 48.7 days last December. The general trend is still up.

Accounts were turning over a full day faster in June of 1959 than in June of 1960. However, the bad debt-loss picture is improving, with net losses down to 0.39% of sales last June 30, the lowest point in 2 years.

The trend toward longer-term credit cards is continuing.

Both annual and permanent cards are increasing in popularity as short-term cards fade. On June 30, credit-card distribution by type was: Annual 55%, permanent 22%, short-term 16%, biennial 5%, and others 2%.

Handling procedures . . . The trend toward automation of credit and accounts receivable persists among credit association members, but the pace isn't so fast.

More credit men are pondering whether to convert to electronic data-processing equipment, but there's no rush, and one executive reports his company could see no appreciable savings in such a move.

Humble Offers Gas for Mexico-Pipeline Plan

• Agreement calls for company to feed gas from huge Texas reserves into California via northern Mexico. Now sponsors of the pipeline project must get an export-import license to cover the foreign leg.

HUMBLE Oil & Refining Co. emerged last week as the key supplier for the proposed pipeline to move Texas gas to California via northern Mexico.

Humble owns tremendous gas reserves in South Texas, particularly in the King Ranch fields of Kenedy and Kleberg counties.

The announcement did not disclose what fields Humble will draw on, except to say the gas would come from South Texas.

In the past Humble has been reluctant to commit its gas reserves in this area to projects involving rate control by the Federal Power Commission. And the proposed project may perpetuate this attitude.

Tennessee Gas Transmission Co., which will build the 34-in. line across northern Mexico, acted as the agent between Humble and Southern California Edison Co., the buyer.

Edison will use the gas for its electric generating plants in the Los Angeles basin. Since the gas would not be resold by Edison, the transaction may not require FPC approval as to rates.

What's involved . . . Humble and Edison signed a letter agreement calling for the sale of about 1.8 trillion cubic feet of gas over 20 years.

Humble would deliver about 108 million cubic feet daily the first year, and this would increase to a maximum of 265 million in the fifth year.

The importance of this commitment to the $225-million international pipeline project is self-evident. Tennessee Gas earlier had signed an agreement with Edison calling for delivery of 230 million cubic feet daily at the beginning and up to 445 million by the fifth year.

Prior to that Tennessee Gas had signed an agreement with Petroleos Mexicanos, the government oil agency of Mexico, to build the line from the Texas border at Reynosa to the California border at Mexicali. Pemex would own the line.

A portion of the gas going to Edison will come from fields in Mexico, and Edison indicated last week that the Mexican gas may be resold to Los Angeles basin customers during winter peak-demand periods.

All companies involved were careful to state that only Mexican gas would be resold. If any of the Humble gas were resold, the FPC would automatically have to approve the rates.

It is presumed that Tennessee Gas, as agent for Edison, must still round up additional South Texas reserves. The Humble commitment will be something over half the amount needed, and Pemex will provide something less than one-fourth.

What's ahead . . . The next step in the complicated pipeline deal apparently involves filing an application with the federal Government for an export-import license.

The FPC in the past has acted on behalf of the President in holding hearings and obtaining information.

The companies, however, have not yet disclosed what legal steps they intend to take to win Government approval for the project.

Once legal wheels start rolling, Pacific Ligting Gas Supply Co. will try to set up a roadblock. Pacific Lighting opposes the project because it would cost the company its largest customer—Edison.

The tieup of Humble with the Edison-Pemex-Tennessee Gas deal is a natural. Exact size of Humble's uncommitted gas reserves in South Texas has not been disclosed, but they are considerable.

Humble this year completed a giant gas-processing-and-cycling plant at King Ranch and last year built a 30-inch gas pipeline from the ranch to the Houston industrial area.

The line presently has a capacity of 330 million cubic feet of gas daily, but this is only a fraction of the potential available from Humble-owned fields in South Texas.

Monterey Sale in Final Stages

HUMBLE Oil & Refining Co. soon will take over virtually all the assets of the Monterey Oil Co.—except for Monterey's stock in Transwestern Pipe Line Co.

Confirmation of the deal came last week from Monterey and Humble, although the transaction may not be closed until early in 1961. Monterey stockholders must approve it.

Of particular significance is the fact that Monterey's 15.8% ownership of Transwestern will not cross into Humble's hands, and it confirms earlier reports that Humble did not want to get into the interstate gas pipeline business (OGJ Newsletter, Oct. 10).

Monterey President Howard C. Pyle said the Transwestern stock may be distributed to Monterey stockholders, but he did not rule out the possibility that "under certain circumstances" it might be sold for cash.

Transwestern recently completed a 1,400-mile gas pipeline from Texas to California. In addition to Monterey, its chief stockholders are Warren Petroleum Co. and J. R. (Butch) Butler, Houston oil man.

In announcing the decision to sell out to Humble, Pyle said Monterey will be dissolved and Monterey stockholders will get "liquidating distributions approximating an ultimate total of $42 per share."

Most of this sum will be distributed immediately following closing of the sale—probably not later than February 1 next year.

The value of Monterey's Transwestern stock — about $13 million—is included in the $42 figure.

The entire deal, Pyle said, is subject to approval of Monterey stockholders at a special meeting soon to be called. The stockholders also must approve the plan of liquidation and dissolution.

In buying Monterey's assets, Humble will get about 15,000 bbl. daily of crude production. About half of this is in California, where Humble is breaking into the retail gasoline market. Other Monterey production is in Texas, Wyoming, Louisiana, and New Mexico.

Humble President Morgan J. Davis said that when the deal is completed, Humble will take over the Monterey employes and organization and operate the business and properties as a division of Humble "for the immediate future."

World-Wide Forecast of Military's Fuel Demands

(Thousands of barrels daily on fiscal year basis)

	Actual Deliveries			Programed Procurement		Estimated Requirements	
	1958	1959	1960	1961	1962	1963	1964
Avgas							
115/145	67	111	82	77	74	68	67
100/130	19	15	15	16	16	15	15
All other	5	4	3	4	3	4	4
Total	91	130	100	97	93	87	86
Jet Fuel							
JP-5	5	13	16	17	18	18	19
All other	254	314	313	305	325	321	320
Total	259	327	329	322	343	339	339
Motor Gasoline	42	45	45	48	48	48	48
Distillate	63	64	67	69	70	70	71
Navy Special	107	136	118	93	94	95	94
Other Residual	36	37	37	41	39	39	39
GRAND TOTAL	598	739	696	670	687	678	677

Military Trims Long-Range Forecast

• U. S. forces will continue as oil's biggest customer, but latest forecast of demand through 1964 shows leveling off or drop for certain products. One surprise is jet fuel. New prediction calls for demand to fall off after 1962.

Clyde LaMotte
Washington Editor

THERE appears to be a definite trend by the military to level off—even reduce—estimates of its future requirements for petroleum products.

At least that conclusion is indicated in estimates for military oil use through 1964 (fiscal year) revealed last week by the Defense Department's Division of Petroleum Logistics.

This does not mean, however, that military use during the next 4 fiscal years will decline from present levels. But it does mean that increases anticipated previously for those years may not materialize.

For example, the military now estimates that in fiscal year 1964 it will need 677,000 bbl. daily of all oil products.

A year ago, it estimated that 1964 requirements would be 725,000 bbl. daily.

But even if the lower estimate proves correct, military purchases in 1964 would still exceed the 670,000 bbl. daily of planned procurement for the current fiscal year (1961).

Nevertheless, the difference between future estimates made last year and those currently being made is a substantial one. The difference is particularly noticeable in aviation gasoline and—perhaps surprisingly—in jet fuels.

The 1964 outlook, as seen in 1959, was for 100,000 bbl. daily of avgas and 385,000 bbl. daily of jet fuels. As seen today, the 1964 outlook is for 86,000 bbl. daily of avgas and 339,000 bbl. daily of jet fuels.

Those decreases are offset somewhat by a slight increase in the outlook demand for motor gasoline used by the military and a substantial increase in anticipated diesel fuel usage.

Also, the lower estimate for 1964 Navy special requirements is balanced by an offsetting increase in other residual fuels.

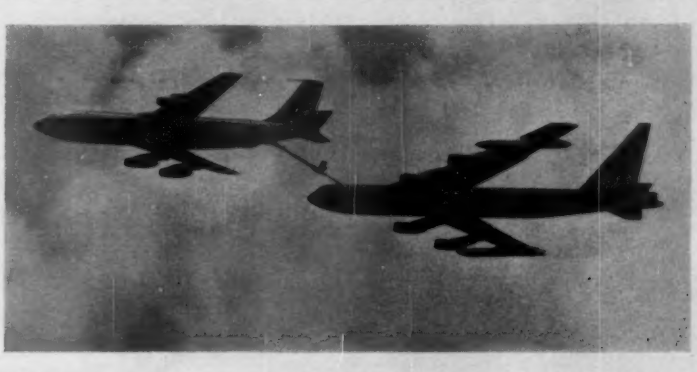
Factors involved . . . The military does not pinpoint any particular reason for the fact that estimates of future requirements are lower now than a year ago.

Rather, they say that many factors go into each year's projections, and that some of these factors are constantly changing. For that reason, the Division of Petroleum Logistics, headed by Vice Admiral Burton B. Biggs, starts from scratch each year in working out with the services the estimates for future requirements.

"We don't want our present thinking influenced by figures we projected a year before," one of the division's top staff men pointed out. "Instead, we shape up the new outlook picture entirely from the facts and factors as we currently see them. This may mean greater year-to-year changes than if we simply revised old figures, but we believe it gives a more accurate picture."

However, there are some factors which are evident to a non-military observer. For one, the military's increasing emphasis on guided missiles could very well affect plans for the size of a manned aircraft arm.

AF Looking for Better and New Uses for Fuels



THE Air Force has a wide range of fuel research projects under way.

Many of these are being done by, or together with, oil company and independent researchers. Even so, the Air Force is always eager to get a helping hand.

Following are some of the key areas for such research:

- Development of test methods to determine physical properties of fuels for use at hypersonic speeds.
- Determination of combustion properties of potential fuels for hypersonic flight.
- Adequate methods of eliminating fuel icing.
- Development of a small-scale thermal stability test apparatus for limited quantity samples.
- Study of explosion hazards of jet fuel.
- Development of techniques of combating bacterial and fungous degradation of fuels.
- Development of fuels with superior thermal stability and higher heats of combustion.
- Investigation of the feasibility of the use of endothermic and vaporizing fuels for high heat-sink applications.
- Development of gas-turbine engine lubricants that will provide satisfactory lubrication in future high speed gas-turbine propulsion systems (bulk oil temperatures from 400° to 700° F.).
- Development of suitable lubricants and techniques of lubrication for missile and space vehicle primary and secondary power systems.
- Development of grease and grease-like materials which will provide a reliable capability under conditions of long-term operation at high temperatures (600° to 1,000° F.), wide temperature range utilization including extreme low temperature, high speed and/or heavy load conditions, and stability in the presence of high levels of nuclear radiation.

Other aspects of a nuclear war may affect the planning for aircraft, naval vessels, and other petroleum-burning military equipment.

Finally, there obviously is the question of how much money Congress will provide.

Military leaders know all too well that it is one thing to plan their requirements and another to get the appropriations with which to purchase them. This is at least true in peacetime.

So, being realistic, the military tries to temper its future estimates of requirements with some shrewd guessing as to the amount of cash it will have on hand.

Other aspects . . . In charting its future demands, the military also runs into numerous other factors which affect both it and the petroleum industry.

One of its toughest problems is how best to correlate future military petroleum requirements with the nation's civilian needs. Unfortunately, the two trends do not always blend. In some cases, they conflict.

The military is aware that in peacetime the oil industry will naturally tend to shape itself primarily to meet civilian needs. That makes a quick switch necessary in event of war.

The problem, then, is to provide as much flexibility as possible in both supply and demand in peace and war so that rapid adjustment can be made to meet a given situation.

The most flexible portion of civilian petroleum consumption is gasoline. By tight rationing to eliminate nonessential driving, large amounts of gasoline or the components from which it is made can be made available on very short notice.

The chief hitch here is that with the growing need for jet fuel and diesel, the military is dipping more and more into the middle of the crude barrel—where there is less flexibility as far as civilian use is concerned.

There are two reasons for this: The military is using more equipment that burns this type of fuel, and it buys lower in the barrel when possible for reasons of economy.

This growing competition for the middle of the barrel means more flexibility can be gained only if the military can adjust to a wider range of products with larger availability or if refinery operations can be more flexible.

One step the military is investigating closely is the possibility of using multifuel engines that will operate on a wide range of fuels. Thus, for instance, an army tank burning diesel could, in an emergency, operate temporarily on gasoline.

Such engines have been developed and tested thoroughly. And although there are some limitations, it appears quite likely that in the years ahead the military will—when ordering new equipment—specify multifuel engines.

Such a step would simplify the problems of the refiner because much of the multi-engine fuel could be blended from a refiner's existing stocks.

And, approaching the problem from the other end, Admiral Biggs has urged refiners to plan their processing

MILITARY FUEL use gets top-drawer attention by the armed services. Five of the key figures who help in mapping the military's future oil needs and is making the purchases from the industry are from left to right, Col. G. D. Pace, U. S. Army; Col. William L. Moynihan, Air Force; Vice Adm. Burton B. Biggs (Ret.), director of petroleum logistics policy for the Department of Defense; Capt. G. T. Waite, U. S. Navy; and Capt. Phillip D. Chubb, USN, of the Military Petroleum Supply Agency, which makes the actual purchases.

streams so that a maximum of middle-of-the-barrel products could be produced if the occasion warrants.

Military experiments . . . Aside from fuel supplies and specifications, the military also is constantly looking for better ways of transporting, storing, and handling fuel supplies.

This includes the Navy's increasing experimentation with collapsible underwater or floating fuel tanks that can be used to provide flexible supplies. Too, the Navy has made some use already of collapsible tanks for deck loading on auxiliary ships.

Other branches of the service are using collapsible containers, fuel-carrying "tires," and other equipment to add to supply flexibility.

Such experimental activities and research add emphasis to the obvious fact that the armed forces are continuing to consider oil as tremendously essential, for without the proper fuels, the military would be unable to move.

1. AF emphasizes change

For oil industry officials interested in fuel use trends by the industry's single biggest customer—the military—a point to watch is the Air Force.

This is not only because of the amount of fuels the Air Force consumes, but because its requirements are changing rapidly.

The tremendous increases in the speed of its planes, the heights they fly, and the distances they span mean that the Air Force must continually emphasize the search for new and improved fuels.

A major trend in Air Force use of petroleum products is toward fuels and lubricants with improved thermal stability.

Currently, it appears that jet fuels stable to 500° F. can be made available using available production techniques. But this, apparently, is not enough. Projected hypersonic flights will require a higher range of thermal stability of liquid fuels, perhaps to as much as 800° F.

To meet the rigors of tomorrow's flight demands, future aircraft systems very likely will require fuels with considerably greater heat sinks than are presently available.

One promising approach to this problem is through the use of vaporizing fuels such as methane, which would provide the extra heat-sink capacity needed.

But the chief drawback to this solution is the added vehicle weight which would result because of the need for tank insulation. There are other problems, too, such as keeping planes fueled and ready for flight with such fuels, because of the extremely low temperatures required to keep methane in a liquid form.

The missile era . . . While the Air Force is continuing its search for the ideal fuel for the superplanes, it is giving even more emphasis right now to missile propellants.

In this area, it appears that pure, or nearly pure, chemicals hold the most promise.

There is the problem, too, of oxidizers. Nitric acid, nitrogen tetroxide, and liquid oxygen are getting top consideration for this use.

Obviously, as the Air Force develops and uses fuels tailored for the supersonic age, its requirements for the more conventional fuels will decline.

For instance, it is likely that by fiscal 1964, the Air Force will have removed from active service most or all of its planes which use Grade 100/130 aviation gasoline. This, of course, ends use of this item.

More pipelines . . . Aside from quantities and qualities of fuels, the Air Force also has keen interest in how best to get the fuel to the right places at the right time.

A major part of its effort to do this is its increasing use of pipelines to supply its domestic bases. This development, of course, is generally in conjunction with industry supply efforts.

Since 1953, 22 Air Force bases have been connected to pipelines. And between now and January 1, four more bases will be added. They are: Sawyer, Michigan; Mountain Home, Idaho; Wright-Patterson, Ohio; and Maguire, New Jersey.

The addition of these four will enable the Air Force to get about 30% of its fuel needs by pipeline. Its 1965 goal: 50% of deliveries by pipeline.

More storage . . . Because jet planes gulp fuel, the Air Force needs as much storage as possible in key locations and dispersed areas.

Current planning calls for construction and leasing of 1.4-million barrels of terminal type storage within the continental United States during the 1961 fiscal year.

Additional projects are likely in 1962, but the size of the program for that year is not yet definite.

2. Army has new program

The United States Army is revising its oil planning and organization to improve its wartime handling of petroleum products.

The purpose is to deliver petroleum in bulk to as near the front as possible, thereby holding to a minimum the use of 5-gallon cans and drums.

Furthermore, under a new concept being put into effect, control of fuel distribution in a given theater will remain under one control from the first point of entry into a theater of operation until it reaches a supply point at the rear of the combat zone.

Through this pinpointing of responsibility of petroleum distribution, the Army expects to avoid delays that almost inevitably crop up under a stop-and-go system wherein control passes from hand to hand as the fuel moves from the landing beach to the combat area.

Who will do it . . . The key organizational change in this new approach is the planned formation of POLIS (Petroleum Intersectional Service), to operate the Army's major distribution system for bulk petroleum fuels.

POLIS will be on the same level as other major subordinate elements of the theater logistical command. That is, it will have the rank needed to do the job. And it will function across geographical boundaries.

POLIS will have two principal duties:

. . . To operate and maintain all bulk petroleum unloading, loading, and storage facilities, and to maintain and operate multiproduct pipeline systems.

. . . To receive, store, and distribute bulk petroleum products to consuming units within the Theater Army.

How it will be done . . . POLIS will utilize the normal military structure of quartermaster petroleum groups, battalions, companies, and detachments.

The basic operating unit of POLIS will be the quartermaster petroleum depot company. Two to five of these companies will be assigned to each POLIS battalion.

Each such company will be capable of operating a single multiproduct line 90 miles long, together with two terminals. And it will handle distribution of bulk fuels to consuming groups with tank trucks and trailers.

This company will also be responsible for product surveillance, using authorized petroleum laboratory technicians and equipment.

In addition, engineer pipeline construction and maintenance units will, when needed, be assigned to the quartermaster petroleum operating battalion of POLIS, together with transportation truck units normally required for transporting bulk petroleum fuels.

The POLIS petroleum battalion, with its assigned operating units, will be capable of controlling the entire operations of and maintenance of a distribution system up to 450 miles long.

When an even larger distribution system is needed, or when there are two or more separate systems within a theater of operations, a quartermaster petroleum group of POLIS will be authorized.

The backbone of the plan will be an intersectional multiproduct pipeline.

The pipeline movement will be supplemented by tank trucks and tank cars to increase flexibility.

POLIS will use automatic data processing systems to expedite and control the flow of data demand and to speed issuance of pumping orders, directives and schedules to POLIS operating units.

Seminar Eyes Military-Civilian Oil Problems

MILITARY-fuel experts and oil-industry representatives got together last week to discuss military and civilian oil developments and to study mutual problems.

The setting was a petroleum seminar held in Washington in conjunction with the annual meeting of the Quartermaster Association.

Some of the highlights:

Military pipelines . . . Col. Merton Singer revealed information on the network of pipelines being used to serve the U. S. military in western Europe.

The system consists of a military pipeline in France and one in Germany, linked by a NATO line available for U. S. use.

The U. S. line in France was the second pipeline to be put in service in western Europe and is the largest and longest line there. It runs 389 miles from Dinges to St. Baussant, about 35 miles southwest of Metz. One segment has a normal capacity of 63,000 bbl. daily, and the other handles 76,000 bbl. daily.

A sea line enables supertankers to unload directly into the system.

The line in Germany runs westward from Zwiebrucken under the Rhine River to Huttenheim on the east bank of the river. It is an 8-in. line, moving only motor gasoline and diesel, and connects with the French line by a NATO link.

Middle East . . . An oil company cannot subsist solely on its production investment in the Middle East, William E. Lindenmuth, Mobil International Oil Co., told the seminar.

He said a company must invest at least three times as much as in other parts of the world to transport, refine, and market the oil it produces.

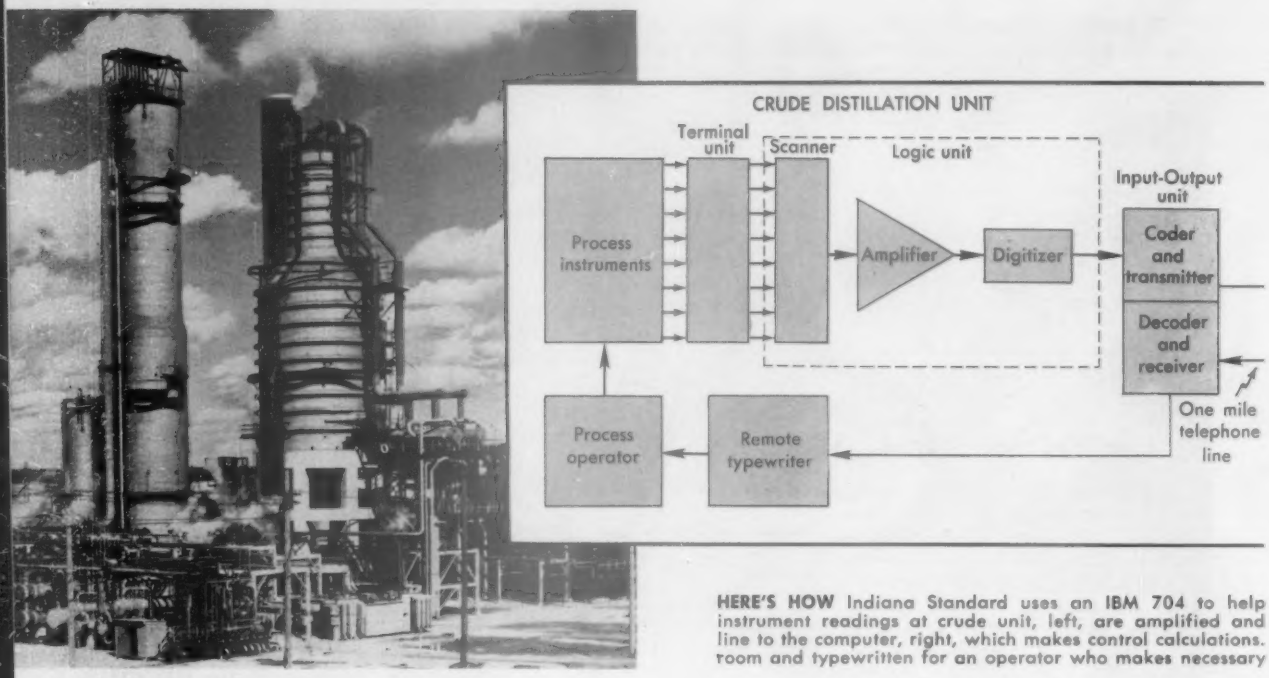
Other points:

Lindenmuth noted that Middle East production increased almost 11% in the first 6 months of this year, that demand in Europe—where two-thirds of the Middle East oil is going—has been up 18 to 20% since the beginning of the year, that the "50-50 pattern is not likely to be disturbed for awhile," and that problems facing international prorationing of crude production appear "almost insurmountable."

Tankers . . . The military is making increased use of privately owned U. S. flag tankers and the services of the U. S. tanker industry, Rear Admiral J. L. Chew, Military Sea Transportation Service, said.

He noted that from a low of about 20% in 1957, private tankers hauled about 57% of the military petroleum in fiscal 1960. He also emphasized the military's need for smaller tankers.

Chew said about 80% of the oil is moved by a controlled fleet which includes 23 Government and 15 long-term-charter private tankers. The remainder is lifted by spot-chartered private tankers.



HERE'S HOW Indiana Standard uses an IBM 704 to help instrument readings at crude unit, left, are amplified and line to the computer, right, which makes control calculations. room and typewritten for an operator who makes necessary

Computer Control Spurs Efficiency at

- IBM brain at Indiana Standard plant handles everything but final control adjustments. The next step, scheduled soon, will be the elimination of a human interpreter-operator.

THE WORLD'S largest refining unit, a 140,000-bbl. crude plant in Whiting, Ind., is operating at a new peak of efficiency with the help of an electronic computer.

Every 4 minutes an IBM 704 computer reads 196 instruments on the big unit at the Standard Oil (Ind.) refinery. Every 20 minutes the computer types control orders derived from about 75,000 stored instructions.

Signals from the instruments reach the computer over a mile-long telephone circuit. Results flash back over the same circuit to a room where they are automatically printed by an IBM typewriter, and up to 19 controls are adjusted.

This prompt guidance was impossible before the computer program was developed.

In some cases, data couldn't have been calculated manually. In others, the required information couldn't have been furnished soon enough to be useful.

Open-loop control . . . The crude unit is on open-loop control at present. That means an operator must make the final adjustments after receiving and interpreting the typewritten data.

Next step is full closed-loop control. In that system, the computer will make adjustments through electronic signals while the operator simply keeps watch. Indiana Standard expects to accomplish this next year.

Company officials think crude-oil distillation is an ideal first choice for computer control. Since distillation is the commonest refinery operation, the techniques developed on the project will have wide future applications.

The unit employs new methods of instrumentation developed by Indiana Standard. These make computer control easier and more practical. Specialized instruments are still under development. One new instrument, now being tested on the unit, is expected to lead to further improvement of the operation.

Plans are already made for a computer installation on an Indiana Standard Ultraforming unit. Catalytic cracking and alkylation units also are being eyed for computer programs.

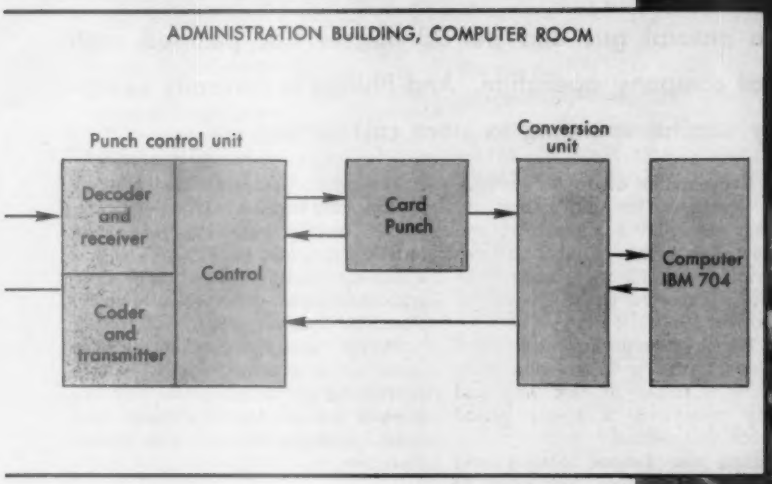
Economic installation . . . Indiana Standard expects a satisfactory return on its investment in computer control. The huge throughput on the unit means that relatively small increases in operational efficiency will bring relatively large savings or increases in profit.

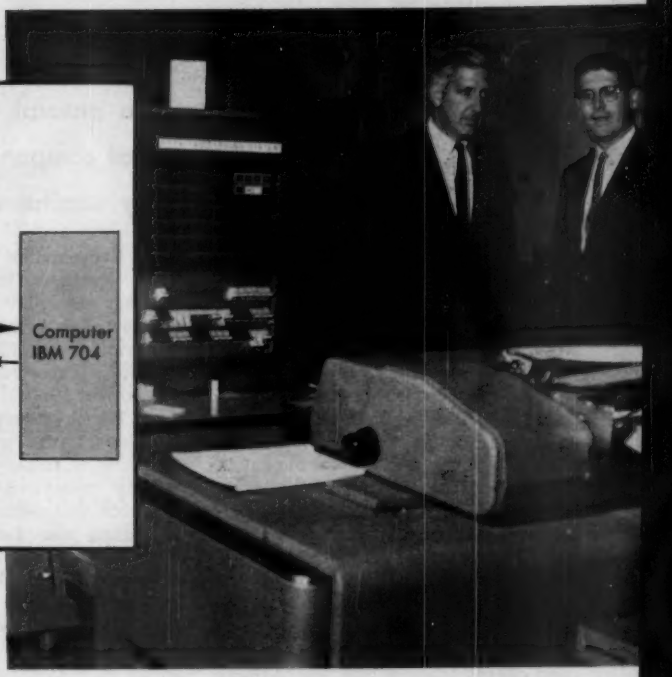
However, the company is looking more toward the long-range impact on refinery operations.

Joint study . . . Preparations for computer use started over 2 years ago. The project required close cooperation of technical specialists from Indiana Standard and International Business Machines Corp. These experts translated the crude unit into a working mathematical model.

Standard and IBM officials feel that the success of the project "clearly foreshadows the rapid exploitation of computer-based industrial control."

Control concept . . . The control concept includes two broad phases. The first seeks to diagnose current operat-





control its 140,000-bbl. crude unit at Whiting. Process-digitized. Digital readings move over a mile-long telephone Results are fed back over the telephone line to the control adjustments to instruments.

World's Biggest Crude Unit

ing conditions of the plant. The second involves optimization which leads to recommended adjustments on controller set points.

The diagnosis is developed as the computer automatically scans instrument readings. Data based upon laboratory inspections may also be added manually.

In the optimization function, values of some variables are compared with the limits they may attain in safe operation. An approximate profit equation is also introduced, along with any conditions imposed by management. Using linear programing techniques, 54 of 161 dependent variable equations are optimized to find the proper settings for up to 19 independent variables.

Optimization yields a detailed picture of the "room for improvement" in the operating condition. Once this is established, the technique also determines changes needed to take advantage of the projected improvement.

The IBM 704 computer can carry out the entire search for the best operating condition. This permits multicontroller adjustments. Formerly, only one controller could be adjusted at a time, and the plant had to settle down before further changes are made.

How it works . . . An annex 25 ft. by 17 ft. was constructed alongside the distillation - unit control building to house equipment for monitoring the process.

Instrument signals from the unit go first to a terminal unit which connects process with data - processing equipment. The terminal unit matches process signals and also serves as a reference junction for thermocouple signals.

Process signals still in analog form, pass to a solid-state logic unit which sequentially scans the 196 inputs in about 75 seconds, amplifies these signals, and converts them to digital form.

The digital information passes to an input-output unit which transforms the signals into a code suitable for transmission over a single pair of telephone lines to the computer room in the refinery administration building a mile away.

When the signals reach the computer room, cards may be punched or the information may go directly into the computer.

The computer is used for control calculations on an interrupt basis. It has a Realtime Package, meaning that it can receive or send digital information in electrical form. Conventional input or output is handled through punched cards or magnetic tape.

Scans, or systematic examinations of process data, may be started in any one of four ways. Two of these make use of a card-punch unit which has a button and an interval timer. There is also a scan button on the input-outpot unit. Or, the computer may be programed to start a scan at desired time intervals.

Data output is always handled directly by the computer through the Realtime Package. Signals are returned to the control building annex, through the input-out units, and then to the remote typewriter.

This is the first time a computer system has so completely controlled any industrial operation as complex as the giant distillation unit.

The big computer handles its task with time to spare for work on other assignments.

New Socony IBM

AN IBM 7090—the most powerful data-processing system to be installed commercially by the company—was delivered to Socony Mobil's New York offices over the week end.

Virtually every department in the New York headquarters will use the computer, which will replace the 704 and 650 machines leased by Socony. Socony will now be able to store mathematical models of all company refineries around the world.

Key to Phillips Gain: It Pays to Diversify

• Branching out into natural gas and petrochemicals has pumped cash through all channels of company operation. And Phillips is currently swinging away from heavy capital spending to more cost cutting.

PHILLIPS Petroleum Co. expects 1960 to be its best year.

The company says the increase in earnings will result from new projects in chemicals and natural-gas liquids.

These two areas got a large share of the $1.7 billion total capital expenditures Phillips made in the 1950's, and just now are beginning to pay off.

Management reports that capital expenditures for 1960 will be about $170 million. This compares with $120.8 million last year, but is off sharply from peak spending of $257.3 million in 1956.

Phillips is deemphasizing capital spending and "concentrating on improving efficiency, cutting unit costs, and consolidating our expanded operations," according to Chairman K. S. Adams.

The company told the New York Society of Security Analysts it is guided by a single general concept: Constant upgrading of products made from petroleum raw materials to reach the highest-priced market.

This has led Phillips into natural gas, natural gas liquids, petrochemicals, and atomic energy operations. Management says income thus generated internally, when protected by cost-cutting ideas, has provided the cash to diversify, reduce debt, and pay dividends.

Adams cited these reasons in explaining why Phillips expects this year's profits to be the greatest in its history despite the depressed conditions in many segments of the oil industry.

Phillips President Paul Endacott said the current harvest from postwar investments has allowed the company to generate enough cash internally to cover capital spending and dividends and still reduce long-term debt by $69 million in the past 3 years.

Exploration . . . An increasing proportion of Phillips exploratory and drilling effort is being directed to finding natural gas.

The exploratory-drilling budget this year provides 60% for work in gas areas and only 40% in crude regions. In addition Phillips' offshore work has turned into natural-gas projects.

Besides routine cost cutting in operations, Phillips has followed a broad exploratory economy policy involving:

. . . Reevaluation of all its undeveloped acreage. This move has cut holdings nearly 50% since 1956 and reduced annual lease rental costs from $7.3 to $4.6 million. Another $1 million is expected to be lopped off this cost in 1960.

. . . Financial support to wells drilled by others. Last year 55 new producing areas were found in this way and drilling costs over a 3-year period were cut $10 million.

Phillips also farmed out or sold some of its offshore properties to others, taking cash or royalties. In this way the company was able to prove oil or gas reserves on 26 of the 30 geological structures under its leases on 150,000 acres. Phillips paid $35 million this year for additional offshore acreage and is now drilling two gas test wells.

Move abroad . . . Phillips, like many other American companies, in the past several years has stepped up its search for foreign oil reserves.

It has been particularly successful in Venezuela where by 1957 about 11,500 bbl. daily production had been established. In that year Phillips also acquired a net interest in 75,000 more acres in:

. . . Monagas state. This acreage now has been proved to contain a major low-gravity oil reserve in shallow, thick oil sands underlying the entire area. Phillips is now taking deliveries of pipe in eastern Venezuela to build a 45-mile, 24-in. pipeline to move 25,000 bbl. daily of crude from Monagas to a terminal on the Orinoco River.

The heavy crude probably will find a market in Europe as burning oil. Phillips is considering using heaters or a diluent to move the heavy crude through the pipeline. Also under consideration is a visbreaking unit at Monagas. The company has drilled 15 wells of a projected 31-well program in Monagas and will increase production above the 25,000 bbl. figure as the market warrants. A refinery somewhere in Europe is within the realm of possibility.

. . . Lake Maracaibo. One of Phillips' lake holdings, Block 10, has been on production since April, 1959, with four wells currently flowing about 6,400 bbl. daily. On Block 17, thirteen good producers currently are averaging 46,000 gross barrels daily under choke. All the wells are tied into production facilities with the oil being barged to a lake terminal for tanker loading. An automatic flow station will be completed in December.

Phillips also is planning wildcat tests on extensive acreage in the French Sahara desert of Algeria, the Spanish Sahara, northern Spain, Australia, offshore Alaska, and British Honduras.

Attack on costs . . . Phillips has approached cost cutting in its producing operations from two angles:

. . . Redrilling. The company has gone into old wells and recompleted them to produce from two or more of the zones discovered when the wells were originally drilled.

Vice President John M. Houchin told the analysts this has increased production while saving the larger costs of new drilling. It costs much less to do this, he said, than it would to drill two or three separate wells.

. . . Automation. Phillips is taking full advantage of increased efficiency and savings in producing operations gained from automatic equipment. More than two dozen automatic lease units have been installed ranging from oil transfer units to a fully automatic tank battery. Semiautomatic central-

PIPELINE

Interstate pipelines paid an average of 14.13 cents per M.c.f. for natural gas in 1959. Total purchases were 7,766,091,446 M.c.f. for which the pipelines paid $1,097,193,512, according to H. Zinder & Associates. Leading buyers were United Gas Pipe Line, El Paso, and Tennessee Gas Transmission. They paid from 11.91 to 15.2 cents per M.c.f. Largest sellers were Phillips, 642,100,649 M.c.f., at an average of 12.48 cents per M.c.f., and Pan American Petroleum, 421,-027,855 M.c.f. at an average of 13.6 cents per M.c.f.

Extension of Shell Pipe Line's 120-mile Delta Pipeline from the Southwest Pass station to the Burrwood

ized operations also are used offshore.

Houchin also reported that secondary-recovery projects are being pursued continuously and now account for about one-fourth of Phillips' domestic crude production.

Integrated operations . . . Philosophy of Phillips' operations, as explained by Stanley Learned, chairman of the executive committee, and Executive Vice President W. W. Keeler, is to get maximum upgrading of raw materials.

To this end the company's crude-oil production and processing, natural gas, natural-gas liquids, and chemical operations are closely knit.

Phillips' wide postwar diversification into petrochemicals was a natural development. The company had built up reserves of special raw materials and had acquired the technical know-how from research and experience to enter the field.

Keeler also pointed out another attraction: "We believe that profit margins on the chemicals will be better than those of conventional petroleum products."

The profits resulting from upgrading raw materials are illustrated in the case of Marlex, Phillips polyethylene plastic. Keeler gave this accounting:

"We assume a current field price of 20 cents a thousand cubic feet for natural gas and the current price of 35 cents a pound for the Marlex plastic.

"Marlex is made from ethylene, which in turn is made from one of the natural gas liquids, butane, propane, or ethane. Assigning butane a value based on its B.t.u. or heating value, equivalent to natural gas, Marlex plastic represents a 28-fold upgrading of the basic raw material."

How Gas-Industry Investment Will Grow

(Million of dollars)

Year	Gross Plant	Construction Expenditures: Total	Production and Local Storage	Transmission	Underground Storage	Distribution	General
1959	$19,840	$1,728	$227	$694	$79	$643	$85
1960	21,850	2,233	267	1,063	87	724	92
1961	23,576	1,918	268	657	131	765	97
1962	25,300	1,916	271	740	100	726	79
1963	27,442	2,380	345	1,006	148	790	91
1964	29,868	2,695	378	1,191	151	858	117
1965	32,521	2,948	427	1,261	176	956	128
1966	35,272	3,057	425	1,308	195	997	132
1967	38,263	3,323	474	1,448	210	1,046	145
1968	41,407	3,493	488	1,541	242	1,070	152
1969	44,741	3,704	544	1,611	279	1,109	161
1970	48,238	3,886	546	1,711	296	1,163	170

SOURCE: American Gas Association.

Big Years Ahead for Gas

A DECADE of growth—fantastic by any standards—is forecast for the natural-gas industry by Wister H. Ligon, outgoing president of the American Gas Association.

Ligon, president of Nashville Gas Co., last week offered AGA convention delegates this prospect for the '60's:

. . . Fuel and gas equipment sales topping $128 billion, which is 5.5% more than the previous 100-year total and almost three times the 1950-59 figure of $46.5 billion.

. . . Investment in improvements and additions to operating facilities totaling $28 billion, 39% greater than had been made in the entire history of the industry by the end of 1959. This includes outlays for production and local storage, transmission, underground storage, distribution, and manufacturing facilities.

. . . A 50% expansion in pipeline mileage from 600,000 to 900,000 miles of field and gathering, transmission, and distribution lines.

The figures prepared by AGA's bureau of statistics, on which Ligon based his forecast, also project a 78% increase in annual natural-gas sales during the decade.

Ligon answered the question of the adequacy of reserves by citing last year's increase of 8.5 trillion cubic feet, after record production.

BRIEFS . . .

West and East stations is due for completion this month. It includes construction of 4.6 miles of 8-in., 6.9 miles of 6-in., and five pump stations and the purchase of one station and 1.5 miles of 8-in. line already in place. The extension will handle 10,000 bbl. per day, formerly transported by barge.

Gas Service Co., Kansas City, has purchased 81.9 miles of pipeline from Panhandle Eastern and 20.4 miles of pipeline from Cities Service Gas, all in the Kansas City vicinity. The deal eliminated an exchange arrangement between Panhandle and Cities Service at Bannister and cut the number of points Gas Service receives from Panhandle Eastern to two, Dodson and Wilkins stations.

Trans-Prairie Pipelines will expand its gathering system by 75% when its new program is completed. It has contracted with Bannister Construction to build 159 miles of 4, 6 and 8-in. line in British Columbia. The program consists of 40 miles of 4-in. from Taylor to Dawson Creek; 30 miles of 6-in. from Boundary Lake to Taylor; 75 miles of 8-in. from Taylor to Milligan Creek; 11 miles of 4-in. from Milligan Creek to West Beaton; 2 miles of 8-in. from Taylor station to tank-car loading rack; and 2 miles of 4-in. from Taylor station to McMahon refinery. Work has begun on the first three projects.

Also for Pipeliners . . .

IN THE NEWS: Humble may become key supplier to proposed Texas-Mexico-California gas pipeline (p. 61) . . . Decade of growth is forecast for gas (p. 69) . . . Connole predicts higher field prices ahead for gas as result of Phillips ruling (p. 70) . . . FPC spells out boundaries of pricing areas (p. 73).

PLUS THESE TECHNICAL REPORTS: How new Transwestern line was designed and built (p. 100) . . . Gas hydrates: A practical control method (p. 130).

Russians Late, but Arrive for Month's Tour

A 10-MAN Russian delegation studded with top technical men in the Soviet oil industry was scheduled to arrive in New York last Thursday night for a month's tour of the U. S. industry.

The group had been scheduled to arrive on Monday for an exchange tour arranged by the State Department reciprocating for the August junket of Russia by U. S. oil men.

The delay in departure from Moscow—made without explanation—resulted in a slight revision of the itinerary, which will take the visitors to installations on the East Coast, Gulf Coast, Mid-Continent, West Texas, and West Coast.

Instead of visiting the Esso Research & Engineering Co. facilities at Linden, N. J., and Socony Mobil Oil Co.'s refinery at Paulsboro, N. J., on October 12 and 13, they will see them at the end of the tour November 9-11.

The Russians were scheduled to go directly from New York to Tidewater Oil Co.'s Delaware City refinery, one of the most modern in the world, October 14, and continue the original schedule from there.

The first week will take them from Delaware City to the Bureau of Mines in Washington, Monday; Continental Oil Co. offshore operations off Morgan City, La., Wednesday; Cities Service Oil Co. Lake Charles, La., refinery Friday; and to Houston for the week end, to rest up for the next week in Texas.

The tour is being conducted by Frank L. Dennis, special assistant to the president of the American Petroleum Institute. With him in the American party will be Robert Ebel, of the Department of Interior, and two interpreters—Harry Brooks and Dr. Norman P. Neureiter.

The Russian delegation includes:

Suren Akopovich Arzumanov, deputy chief of Department of State Committee, Automation and Marine Building; Lev Andreevich Cvoz Detski, scientific worker, USSR Academy of Sciences Oil Institution; Viktor Aleksandrovich Kasatkin, oil refinery director; Grigori Ivanovich Kazmin, engineer, Crozny Scientific Research Institute.

Z. L. Khachatryan, engineer with construction ministry; Sepan Ivanovich Kuvykin, chairman, Bashkir Sovanarkhoz; Gennadi Konstantin Maksimovich, specialist on oil mining, USSR Economic Council;

Imran Musavich Musaev, head engineer, Azneft combine; Denis Nikolaevich Polyakov, section chief, foreign relations, Department of State scientific technical committee; and Boris Sergeevich Semenov, engineer technologist, All Union Scientific Research Institute Oil Industry.

Higher Field Prices Forecast

. . . for natural gas. Former FPC member also predicts trend toward less federal regulation of the industry.

A GRADUAL increase in the field price of natural gas in the near future, but at a slower and more predictable rate than in recent years, is foreseen by William R. Connole, former Federal Power Commission member.

Connole, a frequent advocate of price-conditioned producer certificates, told the AGA convention in Atlantic City, N. J., that FPC's recent Phillips decision would result in greater price stability.

He said new area prices established in the Phillips ruling "are just a shade above where the forces of competition would have placed them anyway."

Connole also forecast:

. . . Greater administrative and regulatory relief for the natural-gas industry through "organic reforms" eliminating much of the trivia which has built up such a backlog of cases before FPC.

. . . A pronounced swing away from federal regulation in favor of more active regulation by state commissions, as a result of price stability.

A wholesale reappraisal of methods of dealing with the rate of return problem, with many matters other than cost of money perhaps being considered.

Inexperienced regulators hit . . . Connole criticized the practice of putting inexperienced men on FPC with the hope they will gain know-how through "on-the-job training."

A frequent dissenter in FPC decisions who regarded himself as a watchdog of consumer interests, Connole was let out by President Eisenhower when his term expired this year.

Connole, who had served on a utilities regulatory commission in New England before coming to Washington as a career man, was replaced by Thomas J. Donegan, a former FBI agent and member of the Subversive Activities Control Board. Donegan said after his appointment, "I've never had anything to do with utilities outside of paying my gas bill."

Paul A. Sweeney, like Donegan a government career attorney without experience in regulation, was appointed to fill the unexpired term of the late John B. Hussey.

The Senate this summer refused to confirm either appointment, leaving the new president free to name his own choices next year.

Wildcats Planned in Georgia, Alabama

WESTERN Georgia and eastern Alabama will get oil tests shortly.

C. H. Cutler, Houston independent, will drill both wells. One will be about 25 miles east and the other 25 miles west of Columbus, Ga., located on the Georgia-Alabama border.

The Georgia well will be drilled first. It will be spudded this week by Smackover Drilling Co. at a location about 5 miles southwest of Geneva, Ga., in south Talbot County. The second well will be drilled after the Georgia well is completed. The Alabama test will be located about 2 miles west of Marvyn, Ala., in Lee County.

Cutler said no wells have been drilled within 50 miles of the Georgia well and even more than that for the Alabama well. Seismic work of some 10 years ago, however, indicated possible producing structures. The tests may go to as much as 5,000 ft. in Georgia and something less than that in Alabama.

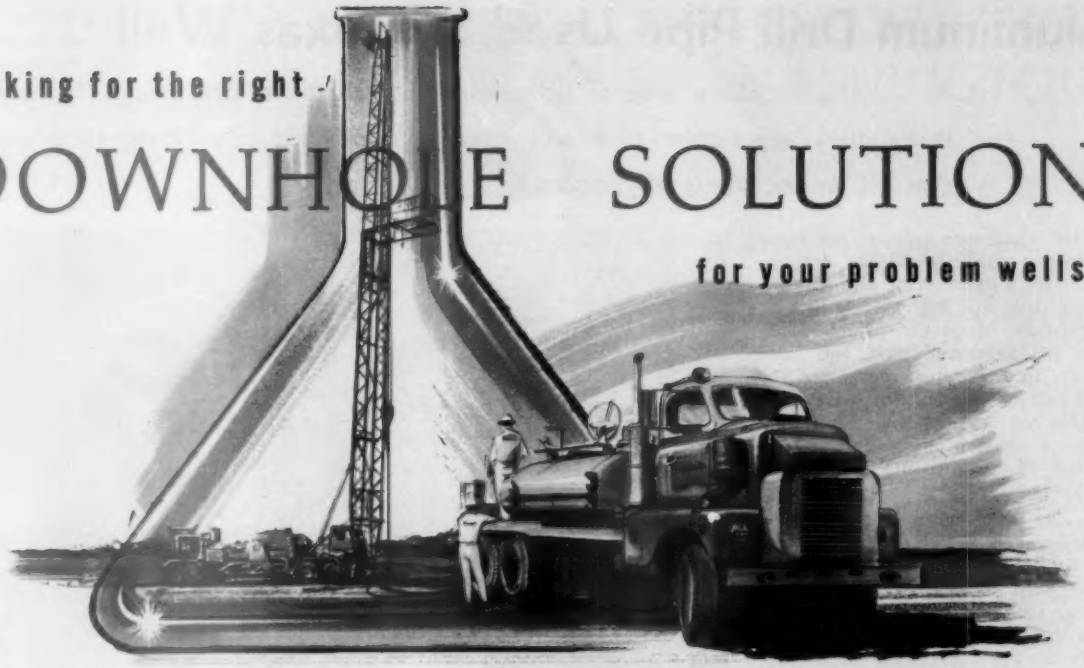
Cutler has leased 20,000 acres around the Georgia well and 40,000 acres around the one in Alabama.

The State of Georgia has offered a $250,000 bonus to persons responsible for bringing in the first 100-bbl. producer, but no one has ever collected. Several tests currently are drilling or are projected, including two by Humble Oil & Refining Co.

Looking for the right

DOWNHOLE SOLUTION

for your problem wells?



ACTION ACIDIZING

Halliburton's Chemical Services for increasing production have long been a standard of the industry. This reputation has been earned by the continuing development of better acid solutions for most any well need. Improved pumping equipment, tools and techniques of acid injection has contributed measurably toward greater efficiency in Halliburton's Chemical Services.

★REGULAR ACID – the most economical treating acid available for improving permeability of calcareous formations. It contains the most efficient inhibitors available.

★PENETRATING ACID – Regular Acid with reduced surface tension for better wetting and spreading ability in formations.

★NE ACIDS – Regular Acid containing surface active agents designed to prevent emulsions from forming during acidizing.

★HV ACIDS – Regular Acid with viscosity adjusted by making a true gel or a controlled emulsion . . . used for retardation or diverting action. The choice of materials depend upon well conditions.

★Fe ACID – Penetrating Acid with other additives which improves efficiency in brine well acidizing by helping to prevent secondary precipitation.

★HF ACID – Penetrating Acid containing hydrofluoric acid and NE agents when needed . . . most frequently used as a first stage treatment to aid in the removal of mud blocks in sand formations. Also applicable in injection and disposal wells.

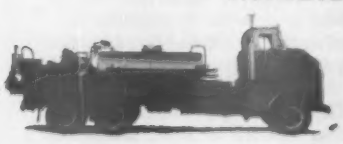
★ALC-5 ACID – a fluid loss additive for any of the above solutions . . . ALC-5 (Acid Loss Control) acts to extend fractures while retarding acid action.

HALLIBURTON'S NEW HOWCO-SUDS Foaming Agent for use in acidizing gas wells . . . water injection and disposal wells . . . cleaning "drowned" gas wells . . . for air and gas drilling . . . a conditioning aid for water fracturing gas wells.

For more information on Halliburton Chemical Services, see your local Halliburton Representative.

HALLIBURTON CHEMICAL SERVICES

HALLIBURTON COMPANY • DUNCAN, OKLAHOMA



275 SERVICE CENTERS . . "CREATIVE CHEMISTRY WORKING FOR YOU"

Aluminum Drill Pipe Used on Texas Well

• Developers claim several advantages for aluminum drill string. For one thing, they say lighter pipe will increase depth capacity of rig since you can lift longer string off bottom.

THE aluminum industry has made its formal challenge to the steel industry for a share of the oil industry's sizable drill pipe business.

Reynolds Metal Co., which developed the aluminum pipe, and Reed Roller Bit Co., which developed the steel tool joints to go with it, last week in Houston released the results of 6 years of research and testing.

Here are some of the claims made by Reynolds:

... **By using lightweight aluminum,** a driller can lift a 16,000-ft. string off bottom without taxing his rig any more than lifting a 10,000-ft. steel string. This means the depth capacity of a drilling rig is increased substantially.

... **Handling costs** and rig moving costs should be reduced with lightweight aluminum.

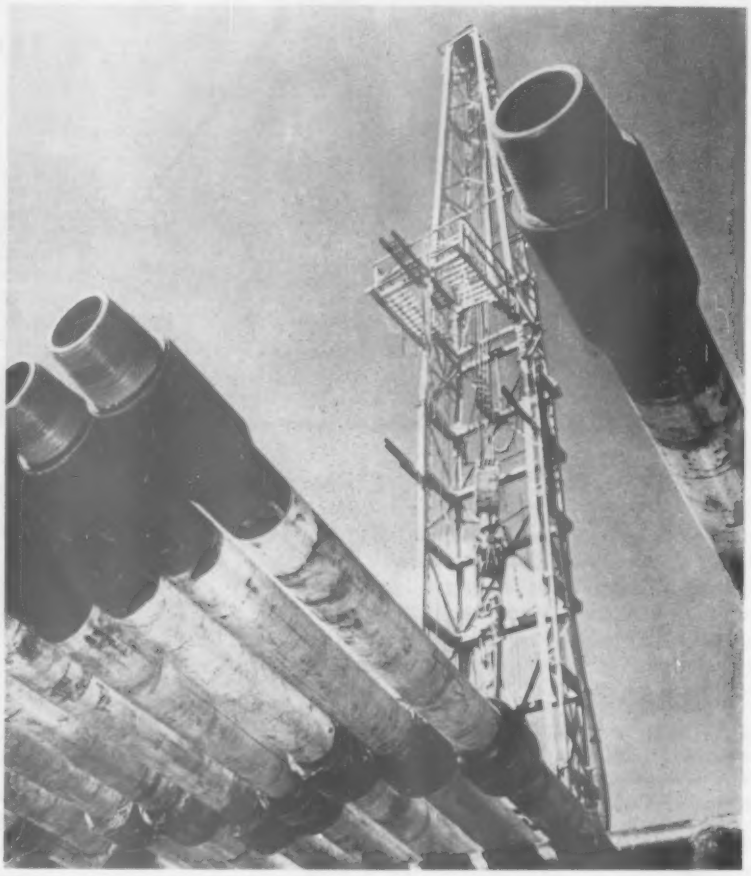
... **Fatigue endurance** has tested at 800,000 to 1,500,000 cycles compared with 500,000 to 800,000 for grade E steel pipe under the same load conditions.

... **Hoisting horsepower** can be cut by one-third to one-half so that smaller and less expensive equipment is needed to drill to a given depth.

... **Aluminum** has a high scrap value—about $1.75 per foot.

... **Aluminum pipe** has less bending stress in whipstocking.

... **Variance in length** is no more than ½ in. from a standard 30-ft. length, shoulder to shoulder on the tool joints. The variance is on the plus side.



SHELL OIL CO. used 4½-in. aluminum drill pipe equipped with steel joints to drill a 10,400-ft. well in DeWitt County, Texas.

Reed's role . . . Reed's research department, working with Reynolds' product development division, used shrunk-on steel tool joints for the drill pipe.

The joints can be applied and removed in the field with the help of small portable heaters which heat the joints to between 650° and 750°. To keep the drill pipe cool, water is circulated through it before the tool joint is screwed on by hand. With cooling, the threads, the shrink-grip area, and the gaging shoulder shrink to a predetermined tightness that stays within the elastic limit of the pipe.

More than 60 laboratory fatigue tests were made on the tool-jointed drill pipe before attaining a satisfactory assembly. Reed has patents pending on the new drilling process.

The field test . . . Reynolds said it has conducted lengthy experimental work and private field tests over the past 6 years.

In the first commercial venture, Shell Oil Co. cooperated with Reynolds in using 4½-in. aluminum pipe on its Rig 25, which is normally a 7,000-ft. unit. The rig drilled to 10,400 ft. in the 1 Alvin F. Sievers, DeWitt County, Texas, reaching total depth last Monday.

Reynolds began field tests 6 years ago with 500 ft. of 4½-in. pipe in 20-ft. sections with steel joints. The string accumulated 60,000 ft. of drilling before being laid down for examination and evaluation. The results were good enough, Reynolds said, to justify continuing the work that produced today's commercial pipe.

The weight . . . Lighter weight is, of course, the prime factor that makes aluminum potentially attractive.

W. G. Reynolds, executive vice president of Reynolds, made the claim that aluminum, in weighing about half as much as steel, will penetrate up to twice the depth of steel pipe before exceeding a rig's hook capacity.

Aluminum pipe of 4½-in. diameter weighs 8.6 lb. per foot, compared with 15 lb. for steel. This amounts to 200 lb. difference for a 30-ft. section. Two men can lift a 30-ft. aluminum section, Reynolds said, while it would take four men on a steel section.

Marketing . . . Reynolds is still undecided how it will market its new product.

Only one size—4½ in.—is available, and the company is currently trying to place strings of it with major companies to get additional performance data.

The pipe being placed is not being sold, and Reynolds is now deciding whether it will adopt a policy of selling pipe or leasing it.

FPC Spells Out

. . . boundaries of pricing areas named in statement.

THE FEDERAL Power Commission last week defined the boundaries of the pricing areas it had announced in a policy statement made at the time of the Phillips case decision (OGJ, Oct. 3, p. 57).

The FPC said it was making the detailed descriptions available to help producers and others determine the area price which will apply to them.

The areas are:

Texas—The FPC will follow the boundaries of the 11 Texas Railroad Commission districts as established by the TRC in its annual report for 1959. Subsequent district changes by the state commission will not necessarily be followed by the FPC.

Louisiana—The dividing line for the northern and southern Louisiana areas is the thirty-first parallel through Concordia, Pointe Coupee, Avoyelles, Rapides, and Vernon parishes in the western part of the state, and following the Mississippi-Louisiana state line in the east from Washington Parish through West Feliciana Parish.

Oklahoma—The Panhandle area includes Cimarron, Texas, Beaver, Harper, Woodward, and Ellis counties. The Carter-Knox area, known as Knox field, is located in parts of Grady and Stephens counties. The portion in Grady County is in Townships 3 and 4 N., Range 6 W., and Township 3 N., Range 5 W. The Stephens County area is in Township 2 N., Range 4 and Range 5 W.

The area is further limited to production from formations below the base of the Pennsylvania series. Areas defined as "other" in Oklahoma include all remaining areas of the state.

New Mexico—Permian basin area includes Lea, Chaves, and Eddy counties. San Juan basin area includes San Juan, Rio Arriba, Sandoval, and McKinley counties.

For Mississippi, Kansas, Colorado, Wyoming, and West Virginia, the FPC pricing area for each state includes the entire state.

watching WASHINGTON

Clyde La Motte

• New FPC policy is an invitation to prompt action . . .

IT WOULD APPEAR logical that the Federal Power Commission's move to an area-pricing approach in producer regulation would spur producer organizations to prompt action. The goal: To provide data to support a move for higher prices in those areas where the initial prices set by the commission appear to be too low.

The FPC, in its Phillips case policy statement, made it pretty clear that an individual producer isn't likely to have much luck in seeking a price above the ceilings.

But the commission did say it would welcome data on area prices. The commissioners make no claim that the guideline prices they have adopted for the areas are perfect. And they appear to be receptive to any group approach that would give them a firmer basis for the area prices. Such an open-minded attitude by the commission is highly commendable, and leaves the next move up to producers.

This would seem to be the ideal place for a producer organization to move into the picture. It could assign a task force to one or more areas with the duty of developing concrete evidence to substantiate a proposed area price.

In doing so, it should be borne in mind that the commission's goal is to arrive at a price which would be high enough to give producers an incentive to maintain an adequate supply of natural gas in the years ahead. At the same time, the commission must bear in mind its responsibility to protect the consumer, too.

This is fair enough, and if the FPC sticks to this view, a greatly improved situation should result.

• There are obvious flaws in the new approach, but . . .

THE FIRST REACTION of some producers and producer-organization officials to the new FPC policy move was to oppose it.

The Independent Petroleum Association of America, for instance, was quick to say that the area-pricing approach won't work.

It justified this opposition by explaining that it had studied the area-pricing system some months ago and had found major flaws in it.

L. Dan Jones, IPAA counsel, said the big flaws the IPAA gas committee had spotted were: Perpetuation of controls, vague standards, danger of a "freeze" on prices, and price discrimination between producing areas.

Furthermore, the way some producers sum up the situation, the new approach by FPC would only hamper any drive for corrective action by Congress.

The way it was going under the old rate-base approach, the FPC was obviously bogging down hopelessly, and it was clear to everyone that something would have to be done soon. To some, this meant a producer decontrol bill.

The advent of the FPC policy, however, aroused fears that a decontrol step would be delayed pending a test of the new FPC approach.

It hasn't been said out loud, but it is quite likely that some producers are planning to drag their feet on the area-pricing plan in the hope that it, like the rate-base method, will be discarded as an unworkable approach.

This would seem to be an all-or-nothing gamble for outright decontrol.

• Trying on a hat doesn't mean you are buying it . . .

AN ALTERNATIVE—and probably a more practical one—would be for producers to register any complaints they have against area pricing, but to go ahead with efforts to establish equitable ceilings.

The commission has come a long way in its dropping of the rate-base, utility-type approach and in its evident effort to apply economic common sense to producer regulation.

It deserves a fair test of its present plan.

THE QUALITY OF THINKING

Archimedes, the ancient Greek philosopher, developed principles of mathematics and mechanics which unlocked secrets leading to the development of some of our most modern processes. His mind was at home in the farthest reaches of the abstract, at work in the closest confines of the practical.

At Brown & Root — whether it is one mind, or a group of minds — thinking knows no boundaries for inspiration. Problems in engineering and construction are solved in ways that consistently save our clients time and money. Brown & Root places a premium on the quality of thought, combined with thoroughly-seasoned knowledge and experience. The results bring back customers year after year, all over the world.

Over two thousand years ago, The Archimedean Screw was introduced as a lifting device for liquids. It is widely used today in moving both fluids and bulk materials.

BROWN & ROOT, INC.

Engineers · Constructors • POST OFFICE BOX 3, HOUSTON 1, TEXAS • CABLE ADDRESS-BROWNBILT

NEW YORK • WASHINGTON • LONDON • EDMONTON • MONTREAL • SÃO PAULO

OCDM Eying Resid-Oil Sales

. . . through a report system. Agency says it must have adequate data in order to make decisions on prices.

GOVERNMENT surveillance of residual fuel oil sales is under way.

The Office of Civil and Defense Mobilization launched the program—first of its type since outright price controls during wartime—by sending out report forms last week to about 60 residual-fuel importers and distributors.

There are two forms. One is to be used for reporting sales and prices from 1957 through 1960 and the other is a more detailed monthly report form for use beginning next January.

OCDM, in a letter with the forms, said one of its duties under the import control program is to determine whether any price increase is necessary to accomplish national security objectives.

It said adequate price information is a prerequisite to its meeting this responsibility. And it said it could find no suitable alternative to the method it is now adopting to obtain such information.

Prior sales . . . Only full tanker cargo deliveries are called for in the form covering 1957 through 1960.

The first such report, for all of 1959 and the first 10 months of 1960, is due November 22. All of 1957 and 1958 are to be covered in a report due December 30. In addition, a report on November cargo deliveries will be due December 22 and one covering December will be due January 23.

The report calls for a monthly breakdown by quantity and revenue in the following categories: For resale, sales to electric utilities, and sales to other users.

A separate sheet of the report requires a monthly comparison of average prices, per barrel, of cargo lots for the years 1957 through 1960.

Current sales . . . Beginning in January, companies will be required to make monthly reports on residual fuel sold for resale and sold directly to consumers.

On sales for resale, there is a breakdown between full tanker cargoes, partial tanker cargoes, barge, and truck or tank-car sales.

Direct sales to consumers are to be reported by mode of delivery, including a breakdown of cargo sales to electric utilities and to other users.

A firm is also required to list the average barrel price by metropolitan area on full tanker cargoes.

The report will also specify quantities delivered to buyers and the quantities picked up at the seller's terminal.

These monthly reports will be due on the twenty-second day following the close of each month. If that day is a Saturday, Sunday, or holiday, the report will be due the following day of business.

The OCDM decision to acquire price reports developed after a hike in residual fuel prices earlier this year brought complaints from New England users and congressmen.

Enco May Be Humble's National Brand

HUMBLE Oil & Refining Co. has come mighty close to admitting that the word "Enco" will become its official nation-wide brand name. But it hastened to state last week that it has reached no "final decision."

The basis for the latest speculation that the "Esso" and "Humble" brand names will disappear along with that of "Carter" is an advertisement carried in the Carter marketing area.

The advertisement displays a service station operator taking off a "Carter" cap and putting on an "Enco" cap. The smiling operator is quoted as saying, "We'll have about 30,000 stations across the country pretty soon."

The obvious deduction from the statement is that Enco's name soon will go up on all Humble Oil & Refining Co. stations.

This assumption is supported by the first Humble station in Ohio. The Youngstown station uses the Humble oval for station identification and has the "Enco" name on its pumps.

At Houston, Humble headquarters said the West Coast advertisement refers to the recently announced decision to place Humble's name on the facade of all service stations—and not to the actual brand name of the gasoline to be sold.

The merger of all domestic operations of Standard Oil Co. (N. J.) into the single Humble organization a year ago has produced much speculation on what brand name Humble will adopt. Jersey has stated that Humble will market nation wide under a single brand name.

Humble's advertising says it is "America's leading ENergy COmpany"—hence, the word Enco.

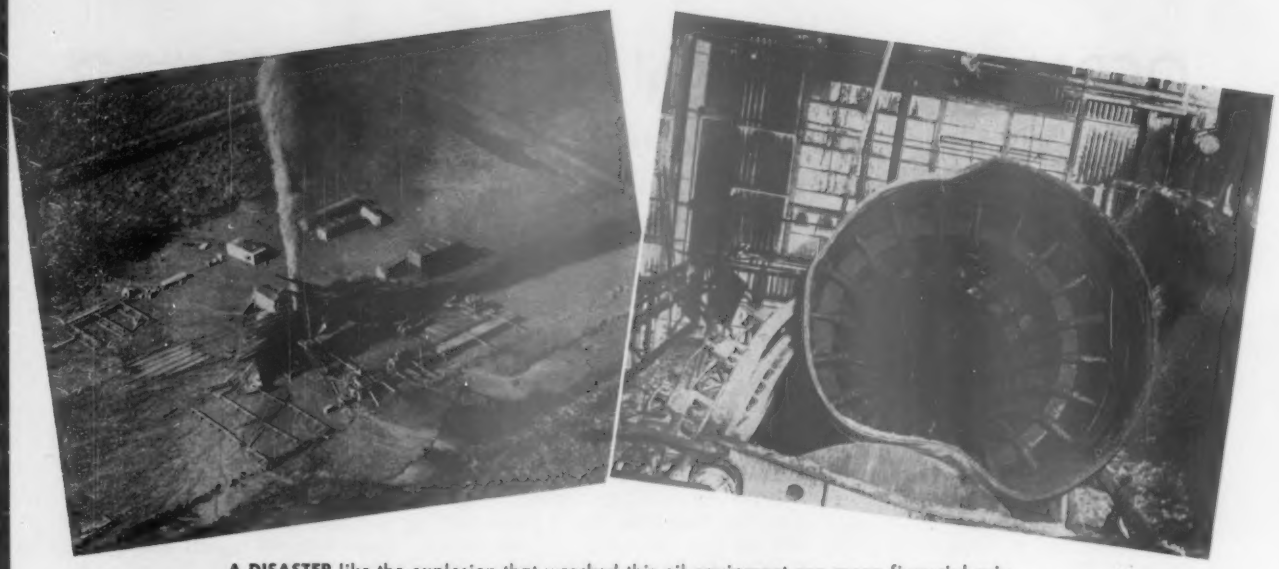
INDUSTRY BRIEFS . . .

Louisiana's depth bracket allowable will be kept at 33% of the March 1953 level during November and December, but production will rise about 15,000 bbl. daily because of new completions. Production under the same allowable during September and October is estimated at 968,000 bbl. daily.

An appeal by The California Co., challenging the constitutionality of Colorado's oil severance tax, has been dismissed by the U. S. Supreme Court. The high court ruled no federal question was involved. Calco based its appeal on a contention the tax is discriminatory and an interference with interstate commerce. The tax, which begins with a 2% tax on income under $25,000 and ranges up to 5% on $300,000 and over, was previously upheld by Denver District Court and by the Colorado Supreme Court.

Cities Service bagged one of the best wells yet in the southwest corner of Kansas. The 1 Sutton "A" in Morton County, 1 mile east of Wilburton field on the edge of Hugoton gas field, flowed 141,000 M.c.f. daily from perforations in Morrow sand at 4,970-90 ft. and 720 bbl. of oil per day from 4,898-4,912 ft.

Purchasers of Texas crude have been asked by the Texas Railroad Commission to submit data on refinery runs and per cent of capacity operated during September. The commission, which also solicited company reports on crude and products storage as of September 1, apparently intends to use the information as an aid in setting the state's crude allowable for November at the October 20 hearing.



A DISASTER like the explosion that wrecked this oil equipment can mean financial ruin . . .

Oil's Insurance Programs Are Getting

• There's a feeling in the industry that revamping of coverage methods may be necessary in these days of soaring operational costs and wider diversification. Risk committees are weighing the pros and cons.

MOST major oil companies are taking a sharp look at their insurance programs to determine just how they stack up in the changing patterns of the industry.

It's unlikely that a revolution in oil insurance is looming. But the increasing diversification of operations, the advent of nuclear energy, and the hammer-blows of inflation point up the need for reevaluating protective measures.

Several big companies have taken a concrete step. They have set up risk committees at top-management level with the aim of finding out whether a new insurance approach is desirable.

Here are some of the factors in the insurance situation:

. . . **Replacement** costs of physical properties, especially processing plants, have mushroomed.

. . . **Many insurance** companies don't want to backstop oil on losses that might stem from "unusual" nuclear exposures.

. . . **Streamlined** types of standard insurance are available nowadays for those who qualify, and oil-sponsored safety education programs have kept accidents down to a level that entices commercial insurance agents.

. . . **New interpretations** of tax laws make it less attractive for an oil firm to set aside reserves for losses in those cases where insurance has been sidetracked in favor of a calculated company risk.

What may result . . . The studies of risk committees might lead to widespread changes in the oil industry's underwriting practices.

These could include a swing away from broad self-insurance, to standardization of dollar-value limits of liability, to increased use of insurance-affiliate setups, and to expansion of company insurance branches to full-department status.

Some divisions of Humble Oil & Refining Co., embracing key Jersey Standard affiliates, have risk committees working on all phases of the insurance problem. A number of other companies set up committees or revamped established committees in order to tackle the matter.

These committee studies cover producing, refining, processing, and field operations. Marketing, automotive, and general liability conditions also are getting a check.

Self-insurance popular . . . Many large companies depend principally on self-insurance. Jersey Standard has a long and successful record in this practice.

Gulf Oil Corp. this year switched to standard coverage for its workmen's compensation insurance after decades of carrying its own protection, but is sticking with self-insurance in other fields.

Some companies preferred to take calculated risks because:

. . . **Experience showed** they could pay losses out of operating funds or reserves and still spend less than they would for standard insurance premiums.

. . . **Their operations** were so widely dispersed that risk naturally was spread thin.

. . . **The high rates** charged in some cases, such as for windstorm coverage in Gulf Coast areas, made purchased policies unattractive.

There are strong arguments against self-insurance.

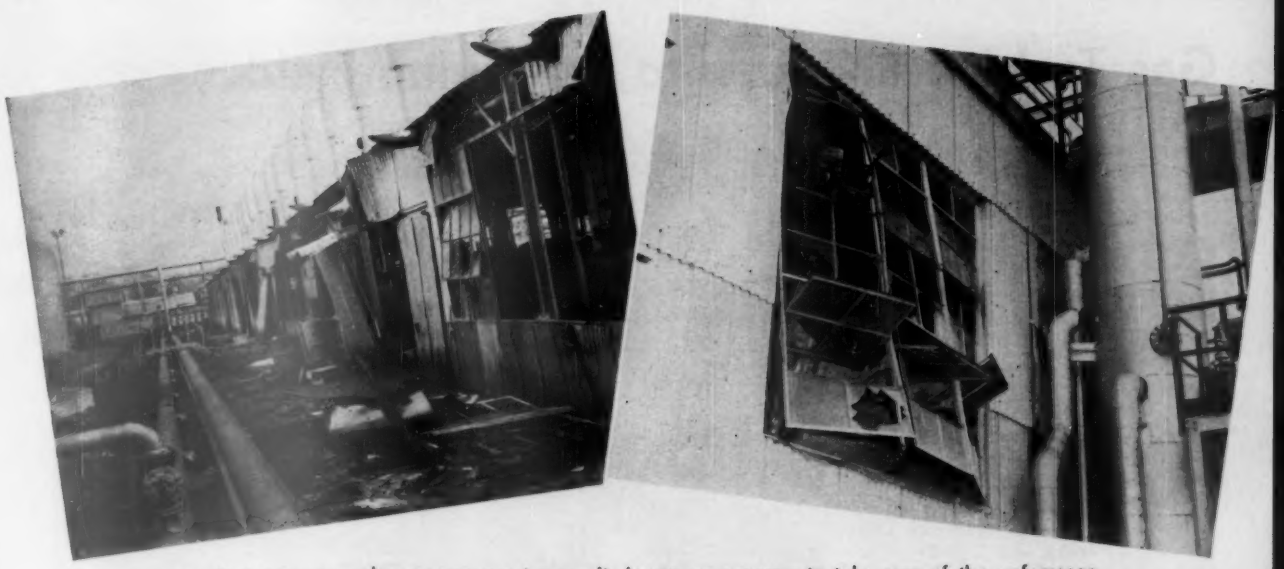
Despite every precaution, a major disaster can take place with serious financial repercussions.

Such a blow might cause unfavorable stockholder reaction, especially if protection against the loss could have been obtained at reasonable cost.

Hidden administrative costs may mount up in a self-insurance arrangement.

A company that lacks insurance may be open to criticism for ignoring or not recognizing hazards and simply bypassing needed coverage.

One company consultant says a firm



. . . to a company unless management gears its insurance program to take care of the unforeseen.

New Scrutiny

"can fool itself by making bookkeeping entries and saying they cover insurables. This is lax procedure. A catastrophe could catch them high and dry, and the losses could stagger and perhaps adversely affect an organization's financial structure."

Purchased policies . . . There are two chief reasons why some companies, such as Texaco Inc., elect to buy standard insurance.

It forestalls the threat of financial disaster in case of a major property loss.

And, a commercial insurance firm provides claim and inspection service on a nation-wide or world-wide basis. Handling of claims alone, in a self-insured company with far-flung operations, could run into serious expense.

Other arguments are advanced in favor of purchased policies. Some oil companies feel the inspection service and recommendations of insurance underwriters have great value at the time of new construction, as well as during normal operations.

A number of company consultants favor standard insurance as a means of reducing losses or expenses to a known amount—the premium. They contend that "when you self-insure, you never know what the losses will be."

Insurance affiliates . . . A middleman's approach to oil protection methods involves the company-supported insurance branch.

For example, Petroleum Insurance Casualty Co. of Houston writes business for the original Humble Oil & Refining Co. and Humble Pipe Line Co.

Sunray Mid-Continent Oil Co. has a substantial interest in Standard Insurance Co., Tulsa. C. H. Wright, chairman of the Sunray Mid-Continent board, and Paul E. Taliaferro, Sunray Mid-Continent president, are Standard directors.

A number of other companies have links with insurance organizations.

New forms . . . Changes in business philosophy, in laws, and in market demands give rise to new forms of insurance.

Retrospective plans have become widespread in recent years. In this approach, rates are established on a basis of actual loss experience during a policy period. The rates are determined at the end of the period and, if losses are heavy, the company pays more than the nominal rate would be. If experience is good, refunds or credits accrue to the oil company.

These plans are used extensively in the workmen's compensation field. Companies can concentrate on preventing losses and thus have a hand in lowering or in writing their own rates. A few states require companies to insure with the state directed workmen's compensation setups.

Nuclear influence . . . Many insurance companies flatly decline to extend coverage to nuclear effects.

Thousands of insurance policies carried by oil companies bear newly attached endorsements which exempt the insurance firm from responsibility for any losses due to certain kinds of nuclear exposure.

However, nuclear protection is available.

Some insurance companies have organized pools to handle large nuclear-coverage packages. A policy of this type can provide protection up to $50 million.

Three of the nuclear pools are the Nuclear Energy Liability Insurance Association, the Mutual Atomic Energy Liability Underwriters, and the Nuclear Insurance Association of Canada.

UNIFORM STANDARD — FORM NO. 700

NUCLEAR CLAUSE AND NUCLEAR EXCLUSION NO. 1

NUCLEAR CLAUSE (Applicable to all Fire Policies): The word "fire" in this policy or endorsements attached hereto is not intended to and does not embrace nuclear reaction or nuclear radiation or radioactive contamination, all whether controlled or uncontrolled, and loss by nuclear reaction or nuclear radiation or radioactive contamination is not intended to be and is not insured against by this policy or said endorsements, whether such loss be direct or indirect, proximate or remote, or be in whole or in part caused by, contributed to, or aggravated by "fire" or any other perils insured against by this policy or said endorsements; however, subject to the foregoing and all provisions of this policy, direct loss by "fire" resulting from nuclear reaction or nuclear radiation or radioactive contamination is insured against by this policy.

NUCLEAR EXCLUSION NO. 1 (Applicable to all Policies to which the Extended Coverage Endorsement is attached): Loss by nuclear reaction or nuclear radiation or radioactive contamination, all whether controlled or uncontrolled, or due to any act or condition incident to any of the foregoing, is not insured against by this Extended Coverage Endorsement, whether such loss be direct or indirect, proximate or remote, or be in whole or in part caused by, contributed to, or aggravated by windstorm, hail, explosion, riot, riot attending a strike, civil commotion, aircraft, vehicles or smoke; and nuclear reaction or nuclear radiation or radioactive contamination, all whether controlled or uncontrolled, is not "explosion" or "smoke".

TYPICAL nuclear-exclusion clause in an oil company's insurance policy emphasizes that coverage does not extend to losses resulting from nuclear radiation or contamination.

Gas Turbine Breaks Into Fracturing Field

FIRST fracturing jobs ever conducted with pumping equipment powered by gas turbine has been completed successfully by a Halliburton Co. crew.

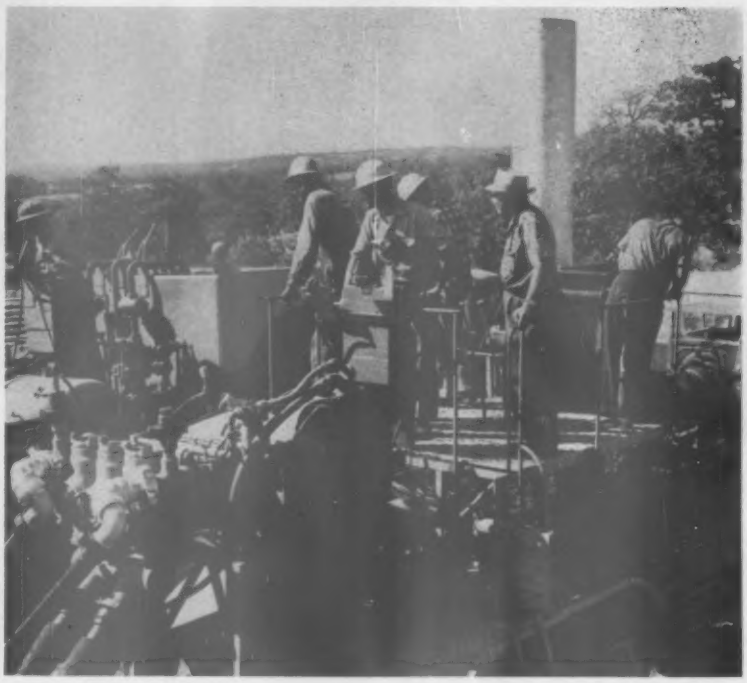
The historic job was performed in Santa Fe field of Stephens County, Oklahoma, and followed months of testing under simulated field-running conditions at the firm's Duncan, Okla., technical center.

The fracture work was performed for Kenneth Kister at his No. 2 Cobb and No. 3 Hollingsworth wells. Both were relatively small jobs. The No. 12 Cobb took 18,000 gal. of water and 20,000 lb. of sand at depths of 689-771 ft. The Hollingsworth took 20,000 gal. of water and 20,000 lb. of sand from 684-915 ft. Complete fracturing required 22 minutes on each well.

The fracturing unit consists of a conventional truck base, mounting a standard Halliburton HT-400 pump powered by General Electric's 900-hp. model 720 axial-flow turboshaft gas-turbine engine.

The gas turbine gave operators half again as much horsepower as they needed for these wells, and response was reported as much better than with other prime movers.

"Based on what we've seen so far, the gas-turbine engine would seem to be an excellent power source for fracturing units," said Harry P. Conroy, Halliburton vice president in charge of field operations.



GAS-TURBINE powered pumps successfully perform their first fracturing job in the field in southern Oklahoma.

The pump r.p.m. rate was increased from 275 to 390 and volume increased by about half at the same pressure rating. Quick responsiveness of engine and pump also was proved in the two jobs. Operator on the truck was able to go from no load to full load in less than 10 seconds.

Strike Threat Hurled by OCAW Official

- Negotiators get down to serious business in bargaining for 18-cent hourly increase in Gulf Coast refineries.

UNION negotiations for an 18-cent wage increase began in earnest in several Gulf Coast refineries last week. And a top union leader said a strike is inevitable unless the companies budge from their no-increase policy.

J. Elro Brown, regional director for the Oil, Chemical and Atomic Workers Union, said in Houston that the companies "have done nothing to indicate they are willing to grant an increase at this time."

Without a change in company attitude "we are going to have to strike," Brown said. "We cannot function as a union and let our people lag behind."

Brown said OCAW president O. A. Knight will determine whether strikes will be made against individual companies or whether a general strike will be called.

The union is asking an increase across the boards of 18 cents per hour for all employes it represents in the nation.

Brown said no increase has been granted to refinery employes in more than 18 months but that employes in other industries have been raised.

Among the companies which were in negotiation with refinery employes on the Gulf Coast last week were Crown Central Petroleum Corp., Houston, American Oil Co., Texas City, and Republic Oil Refining Co., Texas City. Shell Oil Co., Houston, had been in negotiations earlier.

The Gulf Coast region of Texas and Louisiana has about 25 OCAW-represented plants and is the largest region in the nation.

Meanwhile, the OCAW has been stymied in seeking a pay raise at the big Humble Oil & Refining Co. plant at Baytown, Tex., because of a petition by the Baytown Employes Federation for a bargaining-agent election (OGJ, Oct. 10, p. 112).

The BEF was ousted by the OCAW last year as the bargaining agent for the most employes at the plant but is making a comeback. The National Labor Relations Board will hold a hearing this week on the validity of petitions signed by 1,200 workers asking for an election.

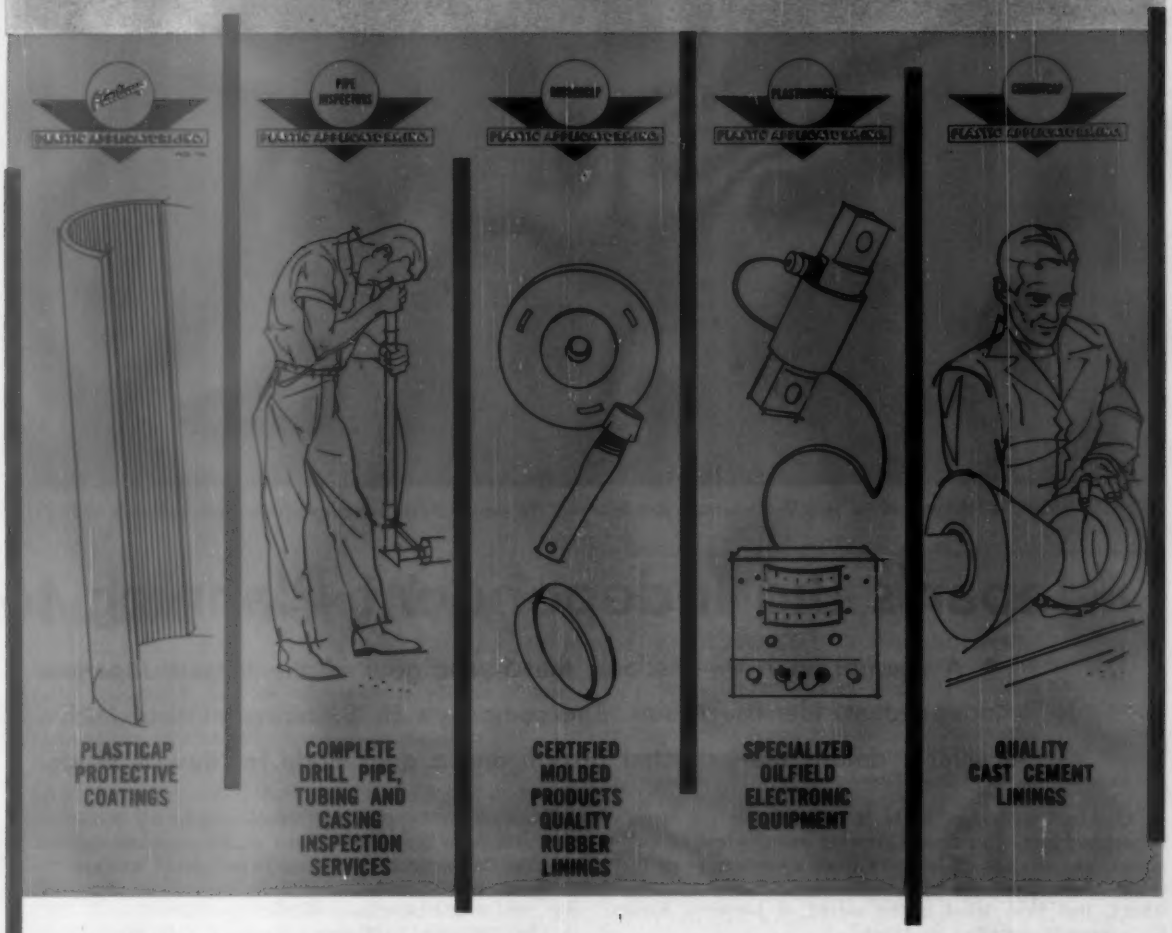
Brown said the OCAW will not try to delay the election.

"We want to have the election and get it over with so we can start the wage bargaining," he said.

Under NLRB rules, no negotiations can take place with management while an election for a bargaining agent is pending.

DOES IT GIVE ADDED BENEFITS TO OUR CUSTOMERS? CAN IT DO THE JOB BETTER? IS ITS COST/EFFICIENCY RATIO ATTRACTIVE?

These questions are asked of every product or service bearing our name.


PLASTICAP PROTECTIVE COATINGS
COMPLETE DRILL PIPE, TUBING AND CASING INSPECTION SERVICES
CERTIFIED MOLDED PRODUCTS QUALITY RUBBER LININGS
SPECIALIZED OILFIELD ELECTRONIC EQUIPMENT
QUALITY CAST CEMENT LININGS

At Plastic Applicators, Inc., we believe that the products and services offered by us to our customers should provide more benefits than similar items already available. We also believe that it is our honest obligation to make it easy for you and your company to do business with us. For this reason, we were the first protective coating company to take its services to the users in South Louisiana (Harvey); the first to locate a plant in West Texas (Odessa); the first to construct a plant expressly for offshore operations (Morgan City, La.). Our progressive research program is the only program to develop a premium grade internal coating ("HTP") capable of withstanding the extra high temperatures encountered in deep well drilling.

Apparently, our way of doing business has been to your liking because it has gained us the reputation of being ". . . the most progressive company of its kind." We appreciate your confidence. We will do everything we can to continue to live up to our reputation. We hope that you will continue to look to Plastic Applicators and its divisions for products that are new, better, improved, and—always—dependable.

General Office: 7020 Katy Road, P. O. Box 7631, Houston, Texas UN 9-3611.
Plants: Harvey and Morgan City, Louisiana. Houston and Odessa, Texas.
Sales Offices: Midland, Dallas, and Corpus Christi, Tex. • Hobbs, N. M. • Tulsa, Okla. • Houma, Lafayette, New Orleans, and Shreveport, La. • Jackson, Miss.

IDEMITSU KOSAN'S Michio Fujihira tells The Journal's Ray Gibson: "We bought Russian crude to help trade balances and . . .

Japan's Big Independent Planning to

• A Journal interview discloses the 5-year goal of the largest Japanese independent, Idemitsu Kosan. The company's U. S. representative, Michio Fujihira, details the expected growth and a deal made for Russian crude.

Q. Mr. Fujihira, as the U. S. representative of Japan's largest and one of its fastest growing independent oil companies, you see the oil industry from a vantage point that would undoubtedly be of great interest to oil-men everywhere. But first, what is the extent of Idemitsu Kosan Co.'s present activities in Japan?

A. We supply 15% of the total market for petroleum products. Our specialty is refining and distribution right up to the ultimate consumer through about 600 service stations selling under the Apollo brand name. Nearly 100 of these are our own stations, and we are building many more. Most other companies do not have their own retail outlets.

We have only one refinery at present, an 80,000 bbl. plant at Tokuyama. We plan to build another 80,000 bbl. refinery in Chiba by the end of 1962. We are planning to build a 60,000 bbl. refinery in Nagoya District by sometime in 1964. A fourth refinery, of about 60,000 bbl. capacity, will be built at Osaka by 1965. We also are studying the petrochemical field, and are thinking about building an ethylene plant of about 100,000-tons-per-year capacity.

Our tanker fleet includes the world's two largest tankers, which are under long-term charter. These are the 104,520-ton Universe Apollo, which took its name from our brand name, and a sister ship, Universe Daphne. Both are carrying crude from Kuwait to Japan. We have several other tankers varying from 25,000 to 46,000 tons under charter. We plan to further charter or build our own tankers to keep up with our crude requirements. We will need both more crude and more tanker tonnage by 1963. We must double our refinery capacity, tanker tonnage, and crude purchases within 5 years.

This expansion will be necessary if only to maintain our present share of the market. The Japanese Government conservatively estimates that total demand for 1960 will be 520,000 bbl. daily. By 1963 demand will increase by 50% to nearly 770,000 bbl. daily. This will be further increased in 1965 to 1,040,000 bbl. daily. Ten years from now, in 1970, the government estimates demand will be around 1,530,000 bbl. daily.

Q. Who owns Idemitsu Kosan and what are some of the other business activities of the principal owners?

A. Idemitsu Kosan is entirely Japanese owned. We specialize in oil, and do not participate in other types of business.

Q. Why is the company opening a New York office at the present time?

A. We have been established in the U. S. for more than 9 years, with an office in Los Angeles. We originally were product importers only. A New York office facilitates crude purchasing and procurement of tanker tonnage.

Q. Between 1955 and 1959, while total Japanese de-

. . . The low-sulfur Russian crude is attractive to us, but . . .

. . . We are not thinking of Russia as a chief supplier."

Double Everything

mand rose from about 190,000 bbl. daily to 363,000 bbl. daily, Idemitsu Kosan not only grew in volume of business, it captured a larger share of the total market. To what do you attribute this outstanding success?

A. Our strength lies in the sales network of our company. We are strong in marketing. If the Japanese system of foreign exchange allocations is discontinued, and we can buy as much oil as we can sell, our sales will soar further. We hope the allocation system, or foreign exchange control on petroleum, will be lifted at latest by 1963. Traditionally we have been strong in sales. We sell to end consumers, know their needs and desires, and can get immediate consumer reaction.

Q. From what countries, or companies, does Idemitsu Kosan presently purchase its oil supplies?

A. We buy our crudes from the Middle East from Gulf Oil, Jersey Standard, and American Independent. We buy some products in the U. S., such as No. 1 fuel oil from Richfield Oil Corp.; Los Angeles, and lubricating oils from DX-Sunray, Tulsa; Gulf Oil, Port Arthur; and Penola Oil, Baton Rouge and Baytown.

We import fuel oil because of the extraordinarily high fuel-oil demand in comparison with gasoline. We have a chronic deficit of low-sulfur fuel oil, which we buy from the U. S. West Coast, and we have purchased 2.5-million barrels of oil in the U. S. this year. We are selling some low, unrefined naphthas in the U. S., and until the end of 1958 sold a few cargoes of gasoline. These were stopped by U. S. import restrictions. We now sell excess gasoline in the Far East, in markets such as the Philippines.

Q. Idemitsu Kosan reportedly has signed an agreement with Russia for 20,000 to 30,000 bbl. daily of Russian crude for 6 years. Are deliveries being made on schedule, and does the oil present any technical problems in refining?

A. We had to buy Russian crude because the Japa-

Founder controls Idemitsu Kosan

THE HISTORY of Idemitsu Kosan Co., Ltd., parallels the success story of some of the big independent oil companies in the U. S., in that the company's establishment and growth is closely tied to the efforts and leadership of one man.

The company was founded nearly 50 years ago, in June 1911, by Sazo Idemitsu, a dynamic figure in the Japanese oil industry who, at 75, is still president and active leader of his organization.

His company has grown from a small marketer to the country's largest independent which is increasing its volume and share of the market.

Idemitsu Kosan's U. S. representative is Michio Fujihira, who joined the company in 1951 after 10 years with a foreign-exchange bank in Japan. He was assigned to the U. S. West Coast in 1952, where he engaged mostly in the purchase of refined products. He formed a wholly-owned subsidiary, Pacific Sunrise Corp., in 1955, of which he is vice president and manager.

Fujihira's chief task since the mid-1950's, when Idemitsu decided to build a refinery, has been to buy crude oil for his company in the U. S., where most purchases are made.

Fujihira, 42, speaks fluent English and is an enthusiastic baseball fan. He lives with his wife and three daughters in New Rochelle, N. Y. His daughters were born in the U. S. and are U. S. citizens.

nese Government wanted to encourage exports from Japan. We are a small country, importing raw materials, manufacturing them, selling them abroad, and living off the foreign exchange earnings. While Japan is against Communism ideologically, the government in order to encourage exports had to buy back some Soviet materials to keep an even trade balance.

The government initially sought to buy iron ore, coal, lumber, and oil from Russia. But the iron ore was of too low a quality for use in Japanese steel mills, and the result was the government had to put more emphasis on oil purchases than it originally estimated. To comply with the government's recommendation and desire, we contracted for a considerable amount of Russian crude oil. Most of the oil is from the Black Sea, with small amounts from Sakhalin Island.

As an incidental reason, Russian crude from the Black Sea and Sakhalin happens to be very low in sulfur content. This is attractive to us because most Middle East crude is high in sulfur. We had been having some sulfur difficulty using Middle East crude only. Shell Oil, to overcome this problem, has been purchasing low-sulfur crude from Borneo, and Caltex, from Indonesia. Russian crude met our own need for sweet crude.

We are not at all thinking of turning to Russia as our chief supplier. As long as we have a certain amount of low-sulfur crude from Russia, we can then buy more Middle East crude from U. S. companies.

Q. Your company reportedly is bringing in Russian crude at a laid down price in Japan of 22-cents-per-bbl. less than Persian Gulf crude, and it is understood the contract has an escalation clause that will reduce the price of Russian oil in conformity with any Middle East reduction. While purchase contracts generally are closely guarded business secrets, can you confirm these widely circulated reports?

A. I was not involved in negotiating the contracts, but according to second-hand information, the contract does appear to have some escalation provision. Pricewise, I don't know what Tokyo is paying for the oil.

Q. In your opinion, has Russian crude been a factor in pushing down crude prices?

A. I don't know whether the price cut was spurred by Russia or not. But a general surplus of crude in a weak market was in existence before the actual price cut.

We like to see a stabilized crude price. Japan buys 97% of its oil abroad. When supplies are tight, as in the Suez crisis in 1956, and major companies increase postings, there are far reaching economic effects in Japan.

Generally speaking, the law of supply and demand will prevail. But we would rather pay a little more for oil—providing the price is still reasonable—in times of crude surplus, and then not have the price jump upward in a time of temporary short supply. Major companies do not understand the hardship caused in consuming countries by sudden price increases.

Q. Is Idemitsu Kosan taking any steps to establish its own crude supplies through participation in exploration or production ventures outside Japan?

A. Not at the moment. We don't wish to take the costly exploration risks required in foreign operations with our limited capital. We like to depend on a constant and smooth flow of supply from U. S., British, or French oil companies. At some future time, however, we may wish to establish our own foreign supplies.

Q. Will the new Persian Gulf crude supply being developed in the offshore Neutral Zone area by a Japanese firm, Arabian Oil Co., cause a major disruption in Japan's crude-supply pattern?

A. No. This oil will benefit Japan's economy, of course. But the government is too wise to tie the economy of the whole country to one far-off oil field which might conceivably be cut off. The country will continue to depend on supplies from major companies with alternative sources of supply. If there is a stoppage in the Middle East, these companies can turn to the U. S., Canada, or Venezuela.

Despite Arabian Oil's success, it has limited capital for expansion, and its present field will supply perhaps 10% of Japanese demand. The Japanese Government will probably ask companies to take a share of this oil as a small part of their over-all supply.

Q. How long do you expect a condition of world-wide crude surplus to last?

A. This will surely improve in 5 years because of the world-wide economic growth rate. There will be more and more crude-oil requirements generated in this period. I am quite optimistic about the general petroleum picture world-wide after 1964. If crude oil is sold at reasonable prices, there will be a great increase in demand over the next 5 years.

If there is too much of an artificial increase in price to maintain levels at a higher point than they should be, it will limit growth in demand, and encourage wider use of other fuels, such as coal and atomic energy.

The market is now very weak, but I expect this to change in 5 years. There even may be a tanker shortage after 1965 unless careful planning is carried out in time to anticipate needs. Oil men are too pessimistic when the picture is weak. On a long-term basis, I believe the outlook is good.

Chile Starts Mainland Oil Production

THE CHILEAN oil industry has reached a milestone with the opening of the country's first crude production on the mainland.

Shipments of crude are now moving regularly from a marine terminal at Bahia Gregorio on the mainland side of the Province of Magallanes. The terminal is on the Second Narrows of the Straits of Magellan. It is opposite Clarencia terminal on Tierra del Fuego, which ships 19,000 bbl. daily of crude produced from small fields found in the last decade.

Bahia Gregorio is supplied by a 35-mile 8-in. pipeline from Faro Este, one of three mainland fields discovered by Corp. de Fomento de la Produccion, the government company which handles all exploration and production. The size of shipments was not immediately learned, but Corp. de Fomento had expected to start commercial operations at the 4,000 to 5,000 bbl. daily level.

Faro Este is a stratigraphic trap that lies for the most part under the straits. Thirteen of the fourteen wells drilled so far have been completed as producers. Most of them were drilled directionally under the straits. Faro Este 15 is drilling.

Another mainland field, Posesion, has one oil and three gas wells, with a well drilling. The third field, Daniel, to date has only the discovery well. But Corp. de Fomento is planning a 45-mile pipeline extension to Daniel from its Faro Este line.

On Tierra del Fuego, construction is starting on a 100-million cubic feet daily gasoline plant. The plant will recover propane, butane, and natural gasoline.

New Refinery Stiffens West German Market

- **Frisia's Emden plant is the third refinery opened in Germany this year.**

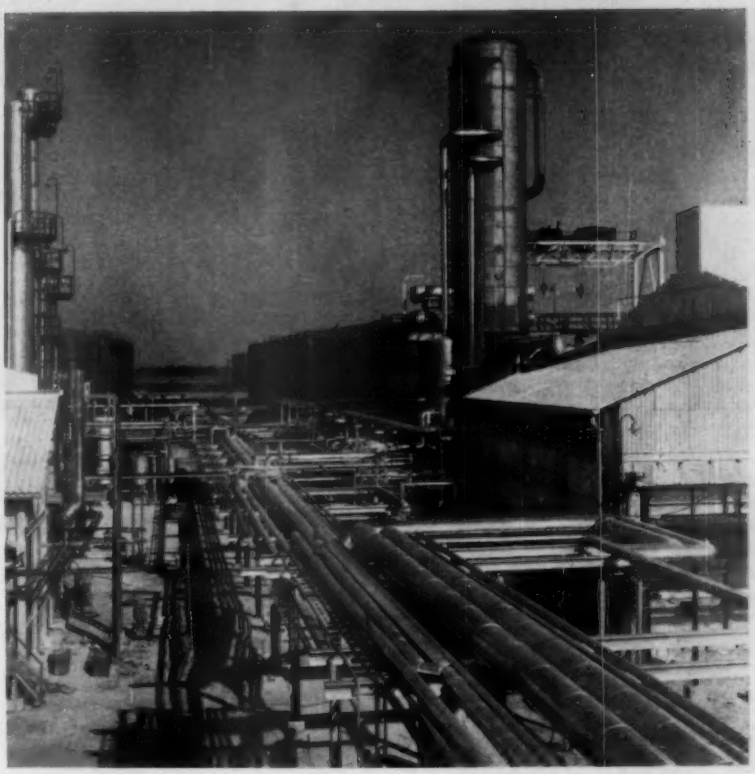
TOUGH marketing conditions in West Germany are due to become tighter with the opening of a 30,000-bbl. refinery at Emden by Erdoelwerke Frisia, A.G.

The plant, built by Ralph M. Parsons Co., went into operation 3 months ahead of schedule at a site on the Ems River, near the North Sea. American Independent Oil Co. reportedly has a 15-year contract with Frisia to supply Neutral Zone crude.

The major units in the refinery, which was dedicated late in September, include a 30,000-bbl. atmospheric crude unit, a 4,000-bbl. nonregenerative-type catalytic reformer, a 5,600-bbl. naphtha desulfurizer, and a 4,200-bbl. distillate desulfurizer.

Frisia, which will compete for both heating oil and gasoline markets, was formed 3 years ago by Gottlieb Duttweiler, whose Migrol company sells under the Frisia brand name in Switzerland. Migrol is supplying products to the German outlets until the Emden plant becomes fully operational.

Since the first service station carrying the Frisia brand opened last December, the company has added outlets in Schweinfurt, Worms, Weil/Rhein, Freiberg, Alzey, and Hannover.



The company hopes to sign contracts with owners of 200 stations.

The Frisia refinery is the third to open in Germany this year. Royal Dutch-Shell has completed an 85,000-bbl. plant at Godorf, and British Petroleum, a 100,000-bbl. refinery at Dinslaken.

Venezuela Makes a Play to Alberta Producers

VENEZUELA'S Dr. Juan Pablo Perez Alfonzo, fresh from the Middle East where he helped mastermind a new organization of oil exporting governments, has made another dramatic bid to solve an overseas problem involving Venezuelan oil.

The Minister of Mines said in Caracas that he will stop all movements of Venezuelan crude moving to Canada that are for destinations west of Montreal. He added that steps will be taken to prevent movements of crude to Montreal itself, if products from the oil are marketed west of Quebec.

He said this policy will apply to crude whether it is sold at posted prices or not. He indicated that he will seek to have shipments stopped by means of "suggestions" to companies involved. But if his requests are not heeded, he will get the necessary legislation to back him up.

Dr. Perez Alfonzo said he is establishing his new policy because the recommendations of Canada's Borden report are not being met. The Borden Commission recommended that crude from western Canada supply all but the extreme eastern part of Ontario, and over a period of time take over this market as well.

The action will affect only a relatively small amount of Venezuelan crude moving into Ontario. Foreign crude totaling 10,000 bbl. daily has been entering Ontario and about half of this is from Venezuela.

But Canada is the second biggest customer for Venezuelan crude, and some Caracas observers believe Dr. Perez Alfonzo is making his move in an effort to ward off import restrictions by Canada that would cut off far more than this volume. There is tremendous pressure growing in western Canada for such restrictions.

Aside from the amount of crude involved, there are far reaching implications in Dr. Perez Alfonzo's move. The minister is known to favor more direct relations between the governments of major exporting and consuming countries. And in the process of dealing directly with countries, he'd like to bypass the oil companies.

The action regarding the sale of Venezuelan crude in Canada, however, goes a step further. The minister of mines apparently believes it is within his province to keep strings attached to Venezuelan oil right up to the gas pump of a distant country.

Dr. Perez Alfonzo said the Canadian Government did not approach the Venezuelan Government either officially or unofficially about the sale of Venezuelan oil in Canada. Rather, Venezuela's policy is based on a wish to respect the Borden Commission report and Canadian public opinion.

Second Arab Oil Congress Opens in Beirut

THE EYES of the oil industry are turned a few degrees north of Mecca this week to the second Arab Oil Congress at Beirut, Lebanon.

More than 500 delegates are expected to attend the congress which opens Monday.

Mohammad Salman, director of the Arab League's Department of Petroleum Affairs, says the meetings will be chiefly concerned with increasing the share of oil revenues for producing countries, and with suggestions for limiting crude production to protect prices.

He said oil companies will come under very heavy criticism for the recent cut in Middle East price postings.

The congress will present a much stronger front than the first session held at Cairo 18 months ago. Iraq, which was notable by its absence last year, will be represented. Venezuela, an observer at Cairo, will be joined in a similar role by several other important producing or consuming countries. The list is expected to include Mexico, Brazil, Argentina, Turkey, India, Pakistan, and Indonesia.

Even Iran, which has a running feud with Arab countries over its relations with Israel, may be in attendance. But this was still uncertain last week.

Stronger words . . . Pre-meeting speculation is that the second congress will have an entirely different flavor from the Cairo conference. Discussions of company-government relations at Cairo were surprisingly tepid. The exchanges may be more lively this time, both in the criticism by Arab delegates, and defense by oil company representatives.

The morale of Arab delegates is high because of their belief that positive action did grow out of the Cairo meeting. This was the formation of the Organization of Petroleum Exporting Countries, (OPEC) an outgrowth of contacts between leaders of producing countries at the first congress.

The purpose of OPEC is to raise crude prices to levels preceding the August price cut, and to present a unified oil policy in the future (OGJ, Oct. 3, p. 71).

The Government of Saudi Arabia has now approved recommendations which brought OPEC into existence, making approval by founding members unanimous. Other participants are Venezuela, Iran, Kuwait and Iraq.

Two of the main issues discussed at Cairo, however, have been put quietly on the shelf. These are a plan for an Arab development bank proposed by Emile Bustani, an influential Lebanese businessman, and a proposed all-Arab pipeline from the Persian Gulf area to the Mediterranean.

The pipeline plan was approved earlier this year by the Arab Economic Council, but is expected to remain dormant as long as the surplus of tanker tonnage exists.

Program agenda . . . Oil company representatives will be very much in evidence in the working sessions.

General industry economics will be discussed by M. E. Hubbard, of British Petroleum, in a paper on "Long-term Demand for Energy and Oil," and George Ballou of California Standard in a paper on "Current Challenges in the International Petroleum Industry."

The key papers are expected from Shaikh Abdullah Al-Tariki, head of the Saudi Directorate, who will cover pricing, and from Frank Hendryx, legal advisor to the Directorate, who has prepared a paper called "The Same World."

Hendryx, a former American oil company lawyer gave the most controversial paper at the Cairo conference. He contended that any government could abrogate any contractual agreement at any time it felt it was in the best interests of its people to do so.

Delegate ranks grow . . . The list of delegates was not final last week, but among company executives planning to attend were William Frazer, managing director of Kuwait Oil Co.; T. C. Barger, president of Aramco; and John Noble, president of Tapline.

The Saudi Arabian delegation besides Shaikh Tariki and Hendryx, includes Faruq Husaini, and Hasan Tayim. Kuwait's delegation is headed by Ahmad Al-Sayyid Omar, and includes Ibrahim Mulla and Faisal Al Mazidi. The UAR delegation includes Muhammad Ahmad Salim. The Lebanese group is expected to be led by Sulaiman Al-Ali, minister of economy. Jordan is represented by Isam Al-Khairi.

Gradual Takeover of Jersey Properties Approved in Peru

THE PRIME Minister of Peru last week won a vote of confidence from the Chamber of Deputies in a political struggle over proposed nationalization of International Petroleum Co. properties.

The Prime Minister, Pedro G. Beltran, won the 74-33 confidence vote after a 12-hour debate over his program to nationalize the properties of the Jersey Standard subsidiary on a gradual basis.

His legislation would be by far the milder of two proposed laws being debated in the country. He would put IPC and Lobitos Oilfields chief producing operations on a 30-year concession basis. And give the government the big share of a 60-40 profit split.

A highly vocal opposing faction has submitted a bill which would virtually confiscate IPC's properties including its 47,000-bbl. Talara refinery, and levy a heavy retroactive tax.

IPC produces more than 90% of the country's 52,000 bbl. daily crude production, and its total investment in the country is estimated at $175 million. It has been under criticism because of its 800-square mile La Brea and Parinas producing area which it operates as private property under the country's mining laws.

Lobitos fields also would be affected. These are owned 50 50 by International and Lobitos Oilfields.

Salvador Refinery Planned

SHELL has revealed plans to build a Central American refinery. The 10,000-bbl. plant will be located at Acajutla, El Salvador. It will be the country's first refinery.

The plant will include a crude unit, hydrodesulfurizer, a platformer, tankage and offsite facilities.

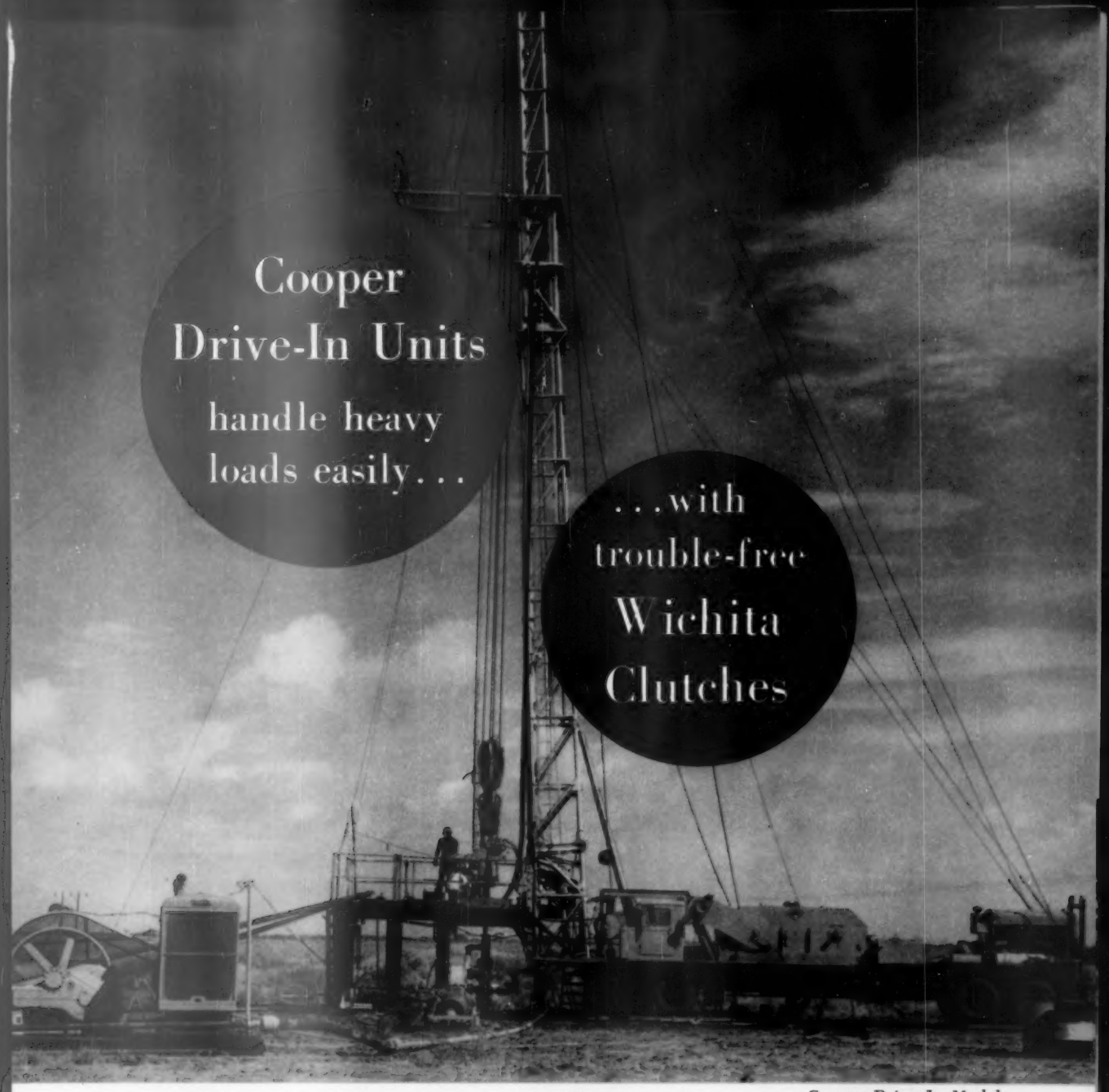
Refineria Shell de El Salvador, S.A., has awarded the engineering and construction contract to Fluor-Schuytvlot N.V. of Haarlan, Holland, a subsidiary of Fluor Corp., Ltd.

Shell did not reveal the source of supply for the plant, but it will probably use crude from Venezuela, where Shell is a big producer.

The company is setting up marketing companies in El Salvador, Honduras, Nicaragua and Costa Rica to help move products from the refinery.

Shell now has sales companies in Guatemala, British Honduras, and Panama.

Demand in Central America averaged 300,000 bbl. daily last year, and is growing at a rate of 10% per year.



Cooper provides years of clutch life and peak efficiency with Wichita Clutches

Cooper drive-in machines not only get to location fast and easy, but provide the clutching on the drums to handle maximum loads without slipping. For years, Cooper has found Wichita Clutches dependable and trouble-free with practically no maintenance required.

For any tough clutching or braking problem, it will pay you to contact your nearest Wichita Clutch Engineer today!

Cooper Drive-In Model TD-42010-42 double drum workover rig with 96' Cooper Derrick, powered by: 275 H.P. L.P.G. Engine.

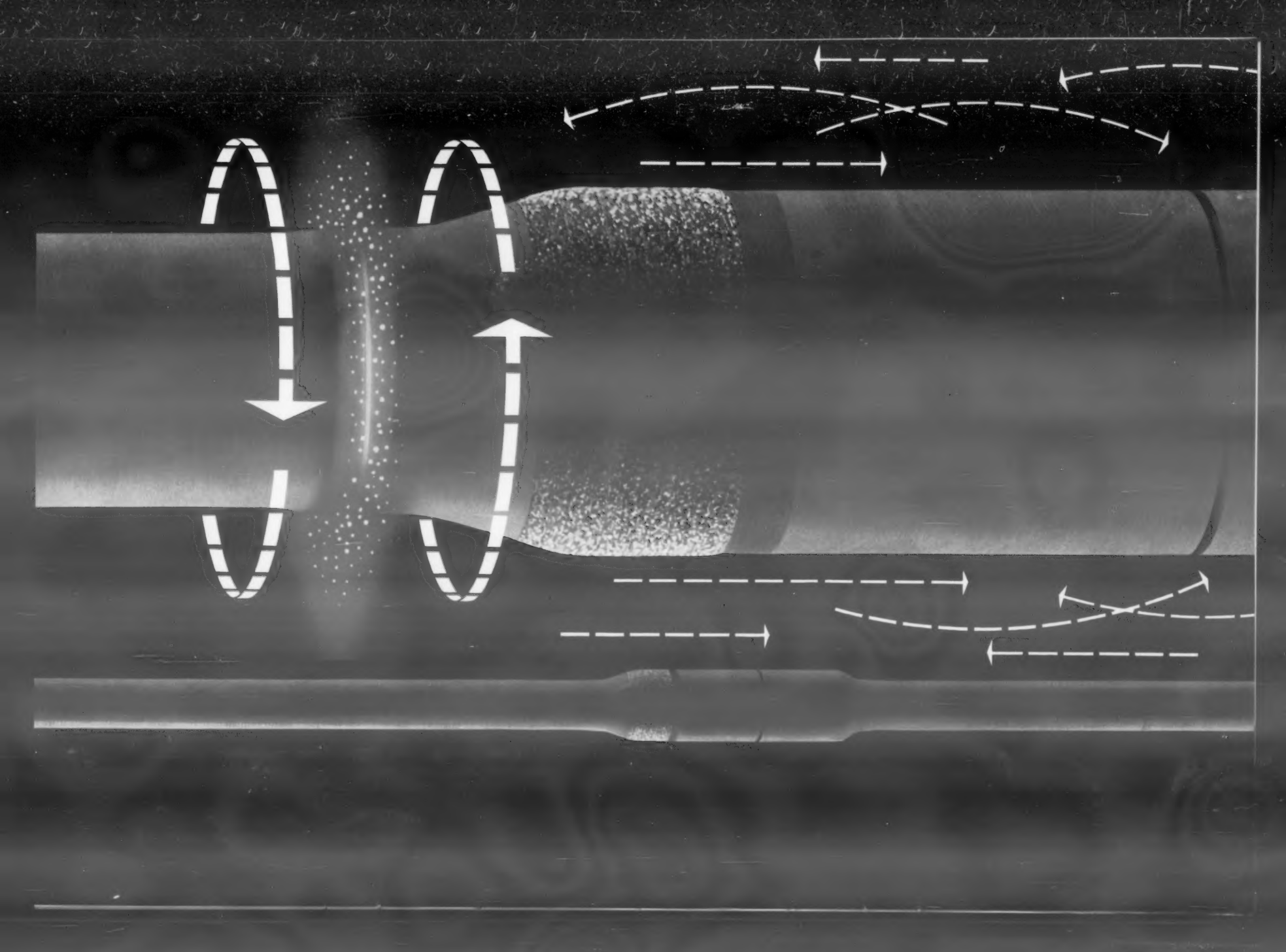
For any difficult clutching or braking problem...

CONTACT YOUR NEAREST WICHITA ENGINEER

Clutch & Control Engineering Co., Livonia, Mich.
Fremont & Lewis, Inc., Cincinnati, Ohio
W. G. Kerr Company, Pittsburgh, Pa.
Smith-Keser & Co., Avon, Conn., Philadelphia 44, Pa., and New York, N. Y.
Frank W. Yarline Co., Chicago, Illinois
Larry W. McDowell, Long Beach, California
Andrew T. Lobel, Denver, Colorado
Robert R. King Co., Cleveland, Ohio
Norman Williams, Houston, Texas
Allied Transmission Equipment Co., Kansas City 8, Missouri
Donald E. Harman, Dallas, Texas
C. Arthur Weaver, Richmond, Virginia
Malcolm S. Cone, Memphis, Tennessee
Dominion Power Press Equipment, Ltd., Burlington, Ontario, Canada
R. E. Kunz, Seattle 4, Wash.
Norman Rupp Co., Portland 4, Ore.
Bates Sales Co., St. Louis 1, Mo.

WICHITA Clutch COMPANY, INC.
WICHITA FALLS, TEXAS, U.S.A.

Write for Wichita General Catalog



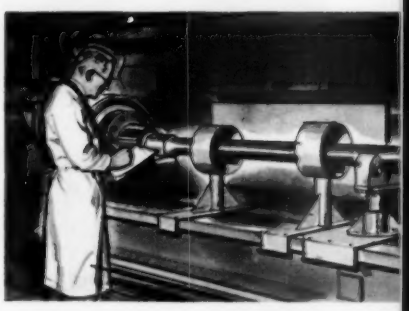
There has never been a field failure in the weld area of a Reed Flash Welded tool joint!

ANOTHER EXAMPLE OF REED LEADERSHIP IN TOOL JOINT DESIGN

For twenty-five years Reed has pioneered advancements in tool joint design—the Shrink-Grip joint which practically eliminated last engaged thread failures—the Internal Flush joint that became API Standard—the Double Streamline joint (the 4½" size later adapted as API Standard 4" Full Hole)—the Semi-Internal Flush joint (later called Extra Hole)—the Super Shrink-Grip joint with cylindrical land and fixed landing shoulder for foolproof field application and removal—the Wide-Open joint for light weight drill pipe—the "tensile impact" test for flash welds.*

Reed research, engineering, and experience are your assurance of the very best in tool joints today *and* tomorrow.

When you buy your next string, remember this—Reed Tool Joints will outlast any others!



ask about the new Reed
Inarclad 60

REED

SUPER SHRINK-GRIP AND FLASH WELDED
TOOL JOINTS

*AND NOW REED SUPER SHRINK-GRIP JOINTS ON ALUMINUM DRILL PIPE.

REED ROLLER BIT COMPANY
Houston 1, Texas

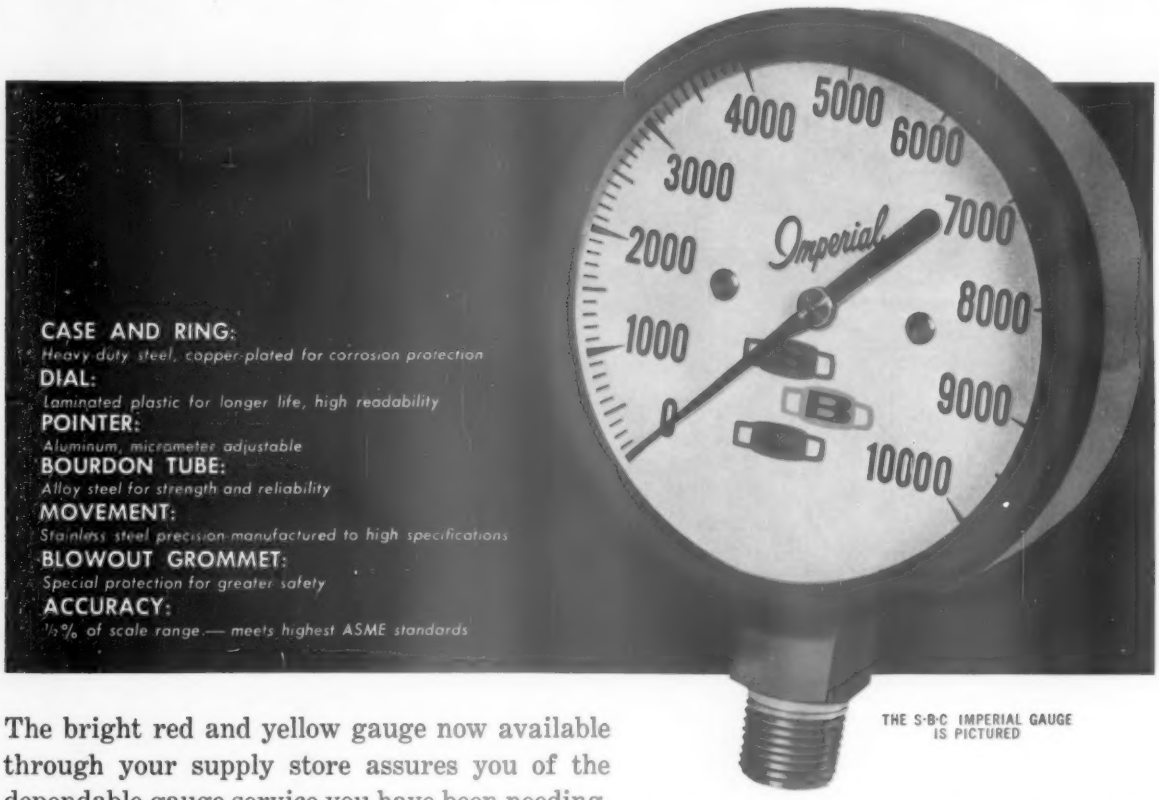
EXPORT OFFICE: TIME and LIFE BLDG., SUITE 3744 ROCKEFELLER CENTER, NEW YORK 20, N.Y.

GULF COAST, MID-CONTINENT AND ROCKY MOUNTAIN DISTRIBUTOR FOR MARTIN-DECKER PRODUCTS

New from Skinner Brothers –

THE OILFIELD GAUGE YOU CAN DEPEND ON!

NOW—A FULL LINE OF S·B·C PRESSURE GAUGES ENGINEERED FOR RUGGED SERVICE—ACCURATE, HIGHLY READABLE, SAFE



THE S·B·C IMPERIAL GAUGE IS PICTURED

The bright red and yellow gauge now available through your supply store assures you of the dependable gauge service you have been needing.

You want a rugged gauge that will stand up under the rough use it's got to take in the oilfield. You want a gauge that you can spot readily, read quickly, and rely on with full confidence. You've got to know you can count on it at all times — you can't risk the error that could mean thousands of dollars lost down-hole. *In short, you've got to have a gauge that will give you your money's worth — and, in a tight situation, more!*

That's the kind of gauge that Skinner Brothers has introduced to the oil patch . . . available at a moment's notice, in the pressure range you need.

Ask for the red and yellow gauge — the S·B·C brand brings greater accuracy to your operation.

FOUR CLASSES OF S·B·C GAUGES TO MEET VIRTUALLY EVERY OILFIELD NEED

(Which one fits *your* requirements?)

S·B·C IMPERIAL — Designed and constructed specifically for oilfield use, a gauge of unmatched quality for heavy-duty application. Available in 4½" dial, pressure range up to 10,000 p.s.i.

S·B·C HYDRO-KING — A high-quality gauge—superior in every feature—for hydraulic service as well as general application. 3½" and 4½" dial, pressure range up to 10,000 p.s.i. Higher pressure ranges available.

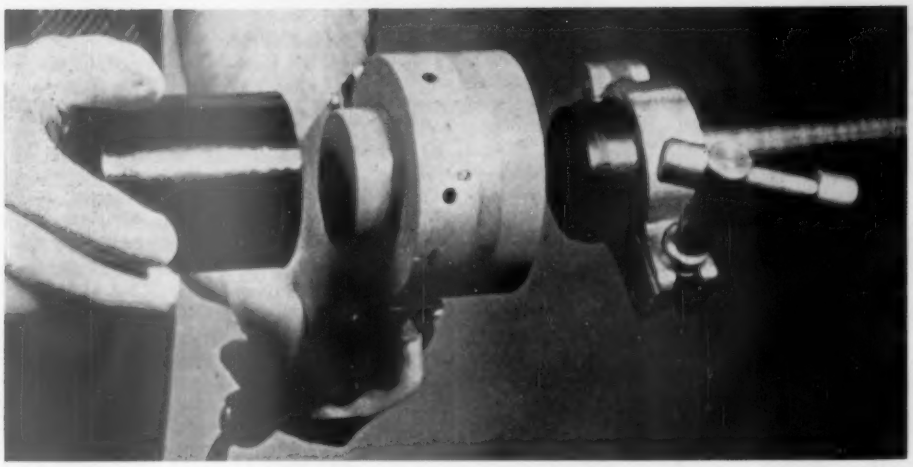
S·B·C CITATION — A medium class gauge engineered for long, accurate service for a wide variety of general purpose applications. 3½" and 4½" dial, pressure range up to 1,000 p.s.i.

S·B·C MONITOR — The economy gauge, featuring precision manufacture and dependable performance at low cost. 2", 2½" and 3½" dial, pressure range up to 1,000 p.s.i.

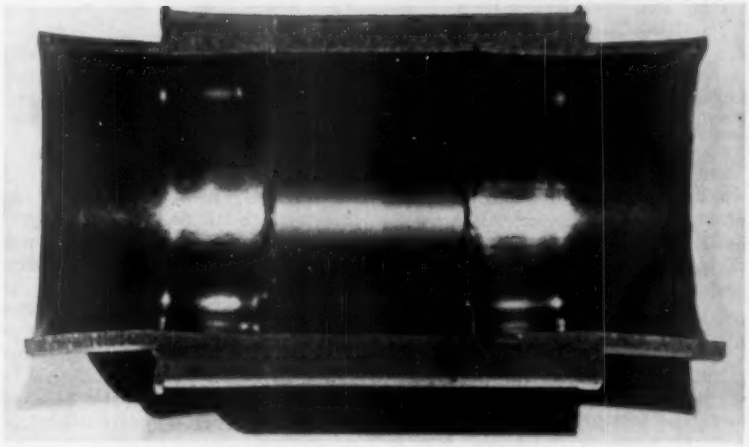
Ask for the Red and Yellow Gauge!

SKINNER BROTHERS COMPANY

Box 628, Tulsa Box 13556, Dallas



HEAT fusion tool, powered by a portable generator or other source of electricity, is used to make up joints in the new acetal resin pipe, left. Integral joint, in section below, is stronger than the pipe itself. Fig. 1.



New plastic pipe passes field and lab tests

BY JAMES C. LEHR AND ROBERT B. ORR
Polychemicals Department
E. I. du Pont de Nemours & Co., Inc.

• Delrin acetal resin pipe makes new applications possible through improved properties not previously available to the petroleum industry. Pipe shows high strength while exposed to sour crude, a high resistance to fatigue, and a high impact strength.

". . . 12 YEARS and 50 million dollars later."

That's the way to describe the development of a new thermoplastic resin by the E. I. du Pont de Nemours Co.

Basically, Delrin was designed as a superior noncorroding product for many applications now using metals. It is a rigid product with a highly crystalline structure. It has both high strength and toughness values and shows outstanding fatigue endurance under pressure-surging conditions. It is resistant to solvents, outdoor weather, and underground burial. It is dimensionally stable and retains its excellent properties over a wide temperature range.

As a result of the excellent combination of physical properties, rigid pipe was one of the first applications which Du Pont explored for this material. Field installations were first made during 1958 in Kansas, Oklahoma, and Texas. Since then, 22 independent field tests have been installed by 8 leading oil-producing companies.

Early tests in the lab showed that acetal resin pipe had superior strength and toughness. The field tests were designed to substantiate the lab tests.

With one exception, all field tests were satisfactory. The only difficulty experienced was some paraffin buildup in flow lines handling low-gravity, asphalt-base crude in Texas. In all other respects the pipe performed better than expected.

Variation of performance due to local conditions was investigated by locating the test sections of pipe in various parts of the oil country.

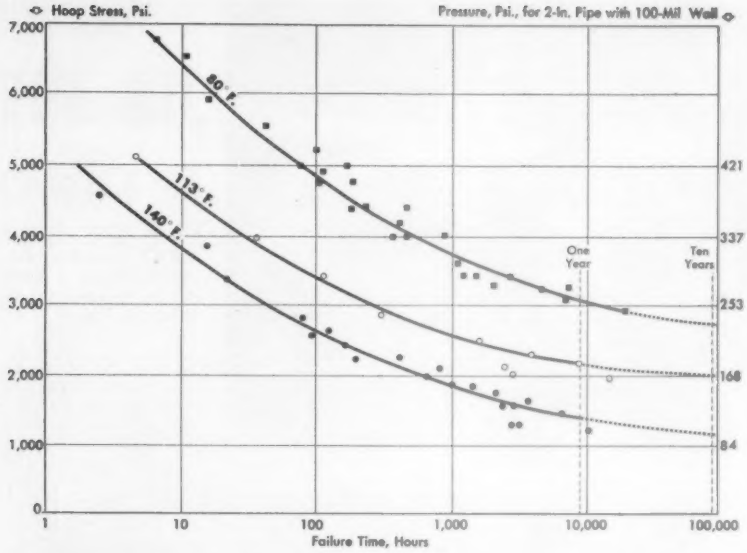
During July and August 1958, 2-in. Schedule 40 Delrin pipe, 0.154-in. wall thickness, was installed as flow and salt-water-disposal lines in Kansas, North Oklahoma, East Texas, and West Texas.

Field Test Results

1. A 550-ft. flow line of the new pipe was buried by Cities Service Oil Co. at Madison, Kans. A plunger pump gave about 55 pressure surges per minute at the 20-s.p.m. pumping rate, 24 hours a day. Temperature was at about 90° F. and the oil was sweet crude.

This field, and particularly this well, had serious paraffin buildup during the winter months, with the flow lines being cleaned from two to four times a month during cold weather.

Recording pressure gages were installed at each end of the line in January 1960. When the gages were removed, they had shown no change in



LABORATORY DATA on the effect of temperature on stress rupture-life of Delrin pipe were obtained using water-filled pipe in a controlled-temperature water bath. Fig. 2.

the operating pressure during a total of 1½ years of service. At the wellhead, the maximum pressure surging varied from 0 to 170 psi., with the average being 22 to 140 psi. At the header end, the maximum surging was 0 to 150 psi. with the average being 20 to 80 psi. There has been no sign of paraffin buildup during two winters. The test line is still in use.

2. In northern Oklahoma, 170 ft. of 2-in. Schedule 40 acetal resin pipe was installed by Phillips Petroleum Co. as a bypass in a 2½-in. lead line, unburied, with variations in pressure of 0 to 450 psi. upstream and 0 to 320 psi. downstream at 26 cycles per minute and 115° F. (500 bbl. per day). This pipe failed in 5 weeks due to abrasion of pipe over a hump in the ground during the violent movement with every pumping cycle. It was estimated that the pipe moved the equivalent of several hundred miles.

3. Sun Oil Co. installed 100 ft. of this pipe at Sea Breeze, Tex., as a loop in the work area at a tank battery, carrying salt water to an injection well downstream of a 50-hp. centrifugal pump. When the tank is full, the pump goes on automatically to pump water to an injection well. It was estimated that the line was in use 50 to 80% of the elapsed time under pressure variations of 0 to 210 psi., 108° F., at a rate of 1,500 bbl. per day. The test was concluded after 6 months of satisfactory service, when a field crew accidentally broke the unburied line by impact.

4. Several 100-ft. sections of pipe were installed by a major oil-producing company in West Texas to test this pipe under field conditions.

(a) A salt-water-disposal line was buried at Rule as a bypass line carrying salt water from the treater to the injection well. A recording pressure gage at the line showed a pressure of 5 to 17 psi., while the temperature varied over a 24-hour period from a low of 59°-104° F., to a high of 120°-130° F. This line is still functioning satisfactorily.

(b) A flow line on top of the ground at Levelland indicated the acetal resin pipe had not resisted paraffin buildup. Temperature and pressure varied during October-February from 52°-77° F., and 49-135 psi.

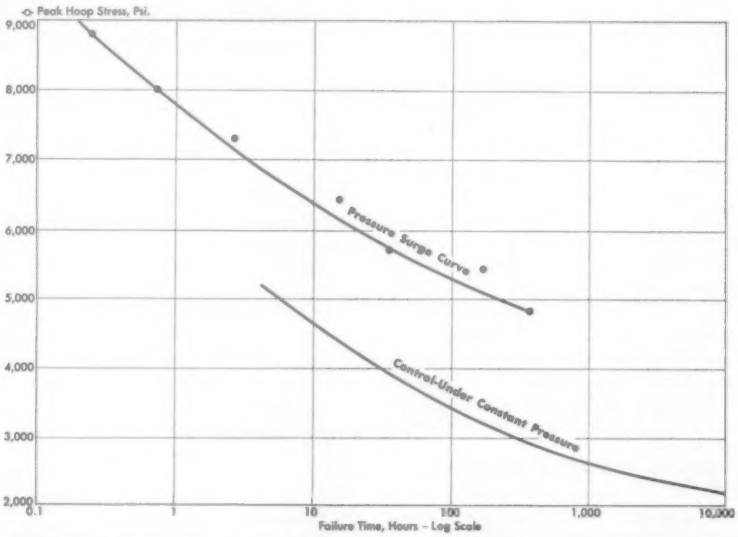
(c) A flow line on top of the ground at Cedar Lake is still on test under average conditions of 10 to 35 psi. and 70° F., carrying sour crude oil. This is a dry salt lake bed where steel pipe must be supported aboveground on racks because it will corrode through in about 3 months if laid on top of the ground. Delrin pipe, however, has been in continuous operation for over 2 years.

(d) A flow line on top of very rocky ground at Iran is still on test, carrying sour crude oil at surging pressures of 9 to 80 psi. There had been slight abrasion of the pipe where it crossed the rocks.

(e) A flow line was installed at Odessa where the steel pipe had to be treated to remove paraffin every month during the winter. The Delrin pipe showed paraffin buildup and was given the standard hot-oil treatment throughout the 1958-1959 winter and part of the 1959-1960 winter until the test was terminated. Treatment was 2 bbl. of oil per minute for a total of 20 bbl., 240°-250° F. at 150 to 200 psi., 15 to 30 minutes treatment time. This is an excellent example of the ability of acetal resin pipe to function under extreme conditions of temperature and pressure.

During October and November 1959, 2-in. pipe, 0.100-in. wall thickness, was installed as flow lines in East Texas and Kansas with the following results to date:

1. At Haysville, Kans., a 680-ft. buried flow line was installed by Kewanee Oil Co., from the well to the battery. This well has very serious paraffin problems and the steel line



RESISTANCE to pressure surges is shown here. Maximum surge pressure, upper line, is compared with rupture-life control curve under constant pressure, lower curve. Fig. 3.

had been steamed once or twice a winter to remove paraffin. A pressure gage at the head of the new pipeline has shown no variation in the initial 5 to 10-psi. line pressure.

2. Petroleum, Inc., installed two flow lines at Haysville and near Great Bend, Kans., from the well to the battery. These new wells are in fields where paraffin has been a serious problem. One 450-ft. line is operating at 20 to 23 psi., while the second 325-ft. line is operating at 26 to 28 psi. Neither line has shown any sign of paraffin buildup to date.

3. Two flow lines of acetal resin pipe were installed by Sun Oil Co. at Sour Lake, Tex., as bypass lines to existing 2½-in. steel lines. One 480-ft. line carried a corrosive oil-water mixture at surging pressures of 25 to 52 psi. and 127° F. This line is still operating satisfactorily. A second 600-ft. line was connected to a flowing well at 70 to 100 psi. and about 80° F. This well has paraffin problems, particularly in the tubing, and the pipe began to develop a coating of paraffin after about 1 month's usage. Since the interest here was only in testing resistance to paraffin, the test was discontinued.

These installations have substantiated our laboratory test results while indicating variable resistance to paraffin buildup. To date, the pipe has resisted paraffin buildup in Kansas (35°-50°-gravity paraffin-base oil) but not in Texas (20°-30°-gravity asphalt-base oil). Work is under way at the Du Pont research laboratories to study paraffin buildup and determine how to modify the surface chemistry to obtain complete resistance to this buildup in all producing areas.

Joints Made Easily

All pipe has been joined in the field using a simple heat-fusion tool connected to a portable generator or other source of current, Fig. 1, to give an integral joint. The joints obtained on a 25-second cycle are stronger than the pipe. Since the joints are integral, the pipeline can be used at full pressure ratings within 1 minute after making up the last joint.

Comparative tests have not yet been made to demonstrate the relative costs for installing Delrin pipe vs. metal pipe. However, cost studies by oil, gas, and water companies have shown that shipping and installation costs are 4 to 8 cents per foot less for lightweight 2-in. plastic pipe. This cost differential should increase with increasing pipe size. Parallel field tests are planned to document this.

Laboratory Test Results

There is a lack of published engineering data on the temperature-strength properties of commercial plastic pipes. For this reason, laboratory tests under identical conditions were run on Du Pont's Delrin pipe and on the present commercial plastic pipes.

Tests were run by pressuring pipe samples with water or oil and immersing the sample in a water bath at controlled temperatures. By holding different samples at different pressures and temperatures until rupture occurred, stress, rupture-life curves were obtained similar to those shown in Fig. 2 for Delrin pipe at three different operating temperatures. Our data showed Delrin, PVC Type I, and ABS Type II to be among the strongest thermoplastic pipes tested in the presence of water. Other pipes tested were PVC Type II, ABS Type I, cellulose acetate butyrate, and low-density polyethylene. Further testing was limited to Delrin, PBC Type I, and ABS Type II.

Because of the varied resistance of plastics to oil, it seemed important to run burst tests with pipe containing crude oil. In lab tests, a West Texas sour crude oil was used. Results showed that Delrin pipe is equally strong in the presence of either water or oil but the other pipes lost about 50% of their long-term strength in the presence of oil.

Resistance to surging pressures is important in field operations. In the laboratories, a simulated test was set up and our research pipe samples were subjected to continuous pressure surging, 30 cycles per minute. Each cycle consisted of ¾ second to reach peak pressure, ¾ second at the peak pressure, ¼ second to drop to 0 psi., and ¼ second at 0 psi.

The data plotted (using the peak pressure) to obtain the same type of stress, rupture-life curves obtained under steady-pressure conditions. Since the pipe sample is at peak pressure only a part of the total elapsed time, the surge-pressure curve is expected to be above the steady-pressure curve. This was true for Delrin. Because it exhibits quick recovery from stress and no loss of strength due to fatigue, the Delrin surge curve was 70% higher than the control, Fig. 3.

For the other pipes, however, considerable strength was lost due to fatigue under test conditions and the long-term strength under surging pressure is only about half that under steady pressure. These results agree with the relative fatigue endurance-limit values obtained with the standard Sonntag tester. This machine cycles a molded dumbbell at 1,800 cycles per minute under alternate compression and tension until failure.

By varying the stress level, a curve is obtained which asymptotically approaches a fatigue endurance-limit stress value. This defines the stress level below which a polymer could be flexed indefinitely. Table 1 lists values for a number of plastics.

TABLE 1—FATIGUE ENDURANCE LIMITS VALUES

Material—	Fatigue endurance limit, psi. (Sonntag tester, 1,800 cycles/minute) 72° F.	150° F.
Delrin acetal resin, dry or wet	5,000	3,000
PVC Type I, dry	3,000	....
ABS Type I, dry	3,000	....
ABS Type I, 100% RH	2,000	Softens and deteriorates
High density polyethylene (Sp. gr. = 0.960), dry or wet	2,000	500
Cellulose acetate butyrate, dry	2,000	....
Cellulose acetate butyrate, 100% RH	1,250	....

Toughness is another important property during handling and installation of pipe in the field. This property is influenced by processing conditions and by the quality of the internal pipe surface. Pipe-toughness measurements were made by means of the standard "drop weight" test, where a 13.3-lb. weight of specified shape is dropped on 5-in. pipe samples from varying heights. The data are then plotted to determine the drop height at which 50% of the samples fail on testing. The height, multiplied by the weight, gives a toughness value expressed in foot-pounds, Table 2.

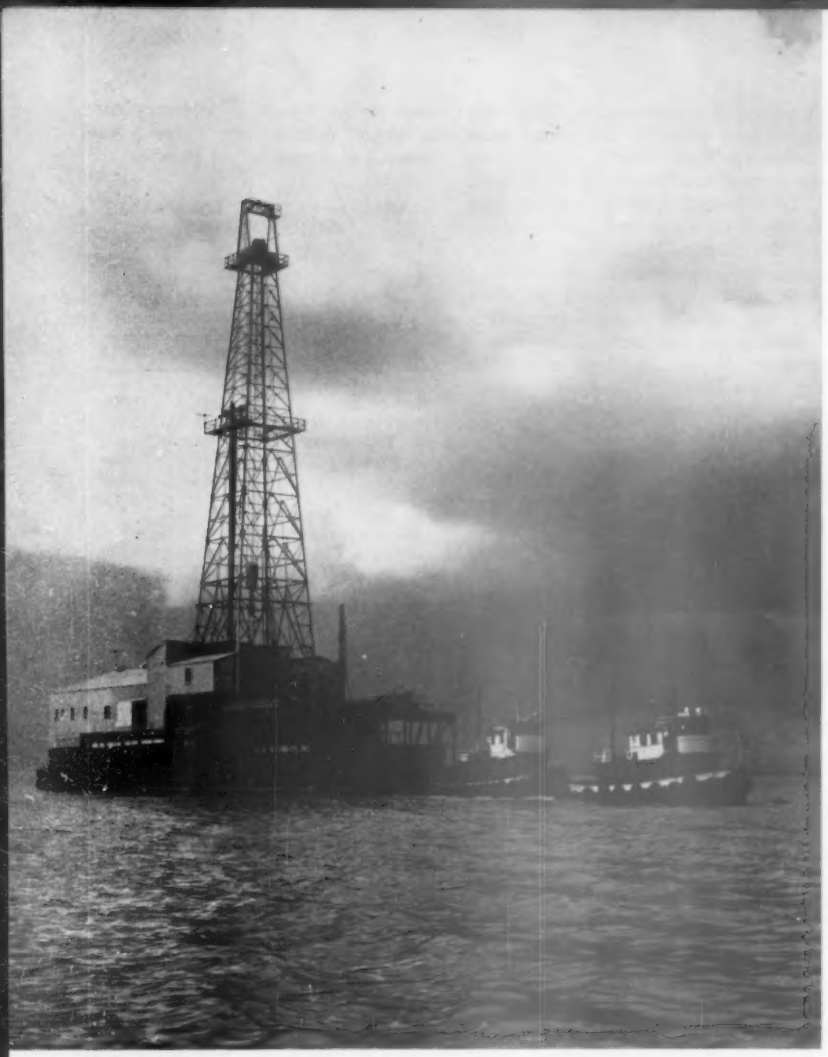
TABLE 2—TOUGHNESS OF PLASTIC PIPES

Material—	Impact toughness at 70° F., ft.-lb. for 50% breakage
Delrin (high impact, high strength)	56
PVC Type I (high strength)	18
PVC Type II (high impact)	50
ABS Type I (high impact)	46
ABS Type II (high strength)	26
Cellulose acetate butyrate	25

Summary

The high strength and resistance to pressure surging in the presence of crude oil demonstrated by Delrin acetal resin pipe has opened new markets not available to present commercial plastic pipes. A comprehensive laboratory test program is under way to obtain long-term design-strength data on this new product. Research programs are being expanded to better define the causes and effects of paraffin buildup.

In view of the satisfactory results from laboratory studies and field trials, test marketing of 2-in., 100-mil.-wall Delrin acetal resin pipe was started in September 1960.



A step-by-step picture story shows . . .

How Gulf set a new drilling record

BY CARL HOOT
Journal Staff

8:00 a.m. Tuesday: Moving toward new location

Dixie Drilling Co.'s Rig 3 is towed toward Gulf Oil Corp's. 5-S State Lease 1773 in Timbalier Bay, La. This is same rig which 1 month before in a nearby well set a record of 5,412 ft. in 1 day.

Time grows shorter

Things happen fast when offshore crews try to outdo each other. Since Gulf drilled the record well described on these pages, Dixie crews have gone out twice more and used the same methods to snip the time even shorter. What's more, a Rowen Drilling Co. crew the other day trimmed yet **another** 4 hours from the Dixie record for the shortest time yet—3 days and 12 hours!

8:30 a.m. Tuesday:
On new location

Conductor pipe had been previously placed. Navigation lights have been removed from the jacket so that the drilling barge can be pulled in. Location is one of three strat holes drilled in the area by Gulf.

PICTURED on these pages is a new oil-industry record in process of being set. The record: drilling to 10,000 ft. in only 3 days, 20½ hours. The place: Gulf Oil Corp.'s 5-S State Lease 1,773 in the Timbalier Bay area of Louisiana.

The hole was drilled by Dixie Drilling Co.'s Rig 3, contracted by Gulf on day-work rates.

Lest anyone think this new speed mark a fluke, consider all these handicaps that had to be overcome:

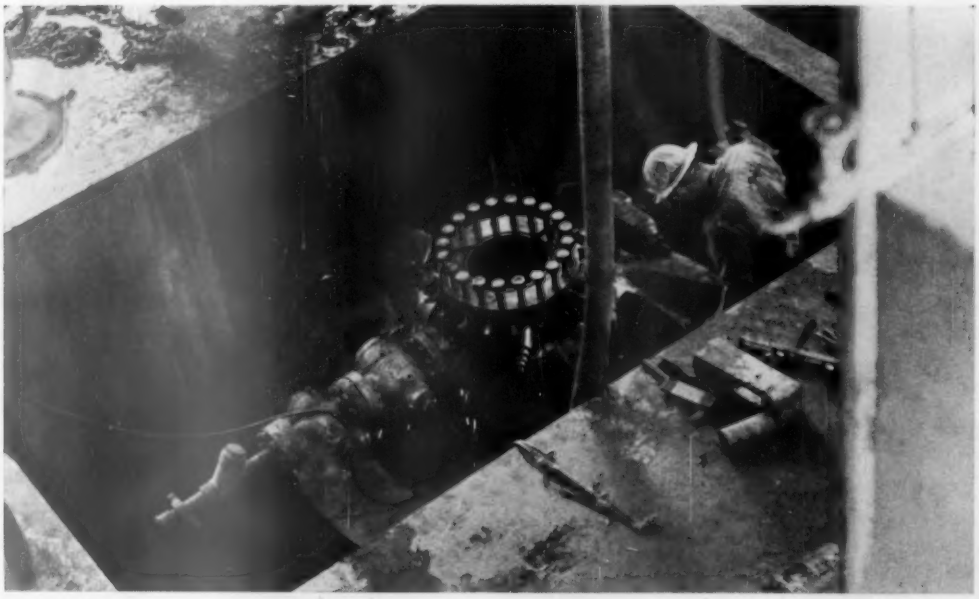
1. The entire 2,000 ft. of surface hole was underreamed.
2. Several hours were lost running surface casing because of mechanical trouble on the rig.
3. First 9⅞-in. bit from under surface pipe ran only 2 hours and had to be pulled because a ceramic jet was blown out.
4. Second 9⅞-in. bit was pulled from the hole with all 3 cones missing.
5. Third 9⅞-in. bit ran only 1 hour and had to be pulled after running on junk from the second bit.
6. Three hours were lost when pump motors failed and there was no cooling water for the draw-works brake nor the engines. For several hours after this, the rig ran with water circulated by cementing pumps on a service-company barge.

Short life for records. Records are broken soon after they are set in

(See following picture pages; text continues on page 98.)

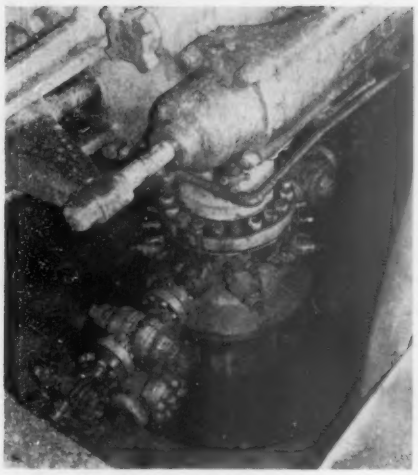
9:00 a.m. Tuesday: Into the slot

Tugs inch the drilling barge around the conductor pipe and jacket as A. R. Chouset, Gulf transportation engineer, directs the operation. One of many reasons for later speed begins here. Rotary table and crown block are carefully lined up over wellhead so kelly bushings readily fall into table after connections.



11:00 a.m. Tuesday: Welding on casing head

Head for the 10¾-in. surface pipe is installed before surface hole is drilled. On this well, conductor pipe was bare. On future wells, flange will be installed before rig moves onto location.



5:00 p.m. Tuesday:
Testing blowout preventers

There'll be no further nippling up after the well spuds because 10¾-in. surface pipe will be set through the preventers into the special casing head below. While this is going on, surface pipe is being taken aboard.

7:00 p.m. Tuesday: Spudding the well

Surface hole is drilled by 12¼-in. bit and then reamed out. Surface formations are soft, so little more than 3 hours was required to drill this pilot surface hole to 2,012 ft.

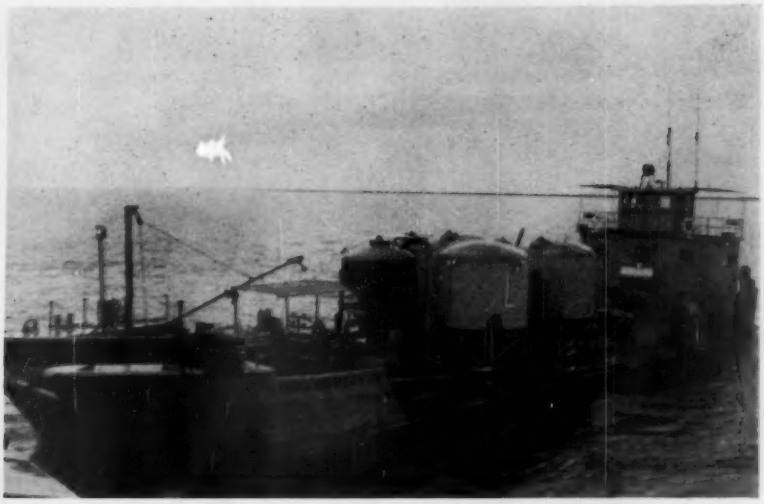
←

11:00 p.m. Tuesday:
Running underreamer

Pilot 12¼-in. hole must be reamed out to 15-in. to accommodate 10¾-in. surface casing which follows. Use of underreamed hole allows using same blowout-preventer stack on surface and long holes.

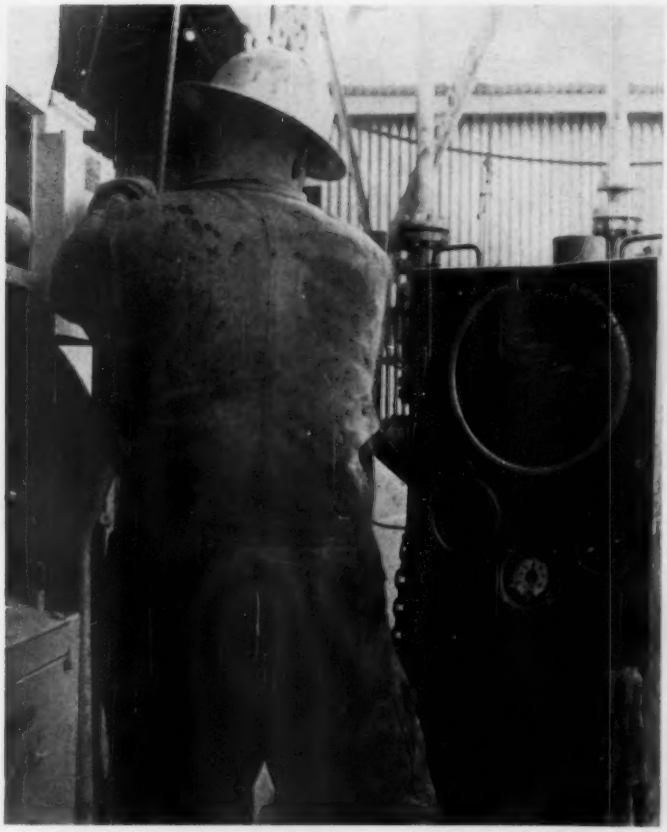
4:30 a.m. Wednesday:
Running first of surface pipe

Only 12 hours elapsed from spudding until 10¾-in. pipe reached bottom. But for mechanical troubles on the rig, the time would have been even shorter. Contract casing crew ran the pipe.



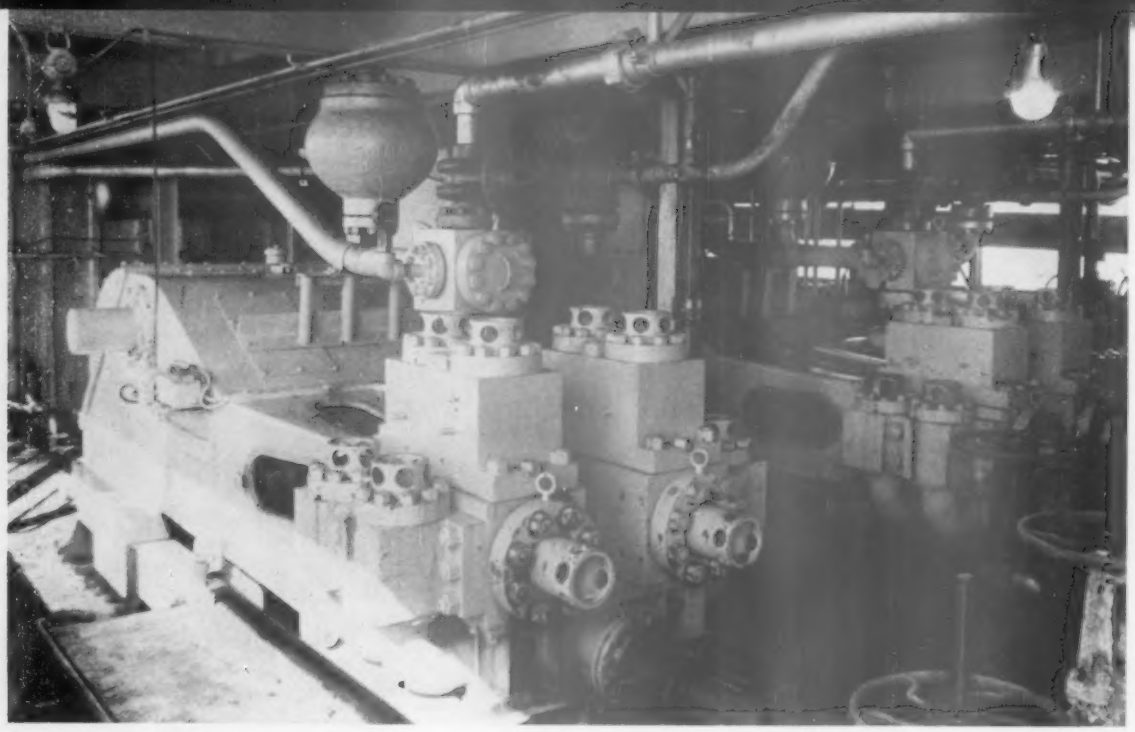
7:30 a.m. Wednesday: Cementing surface pipe

Cementing barge displaces cement to surface around 2,012 ft. of surface pipe. Two days later, this same barge was called back on location for further assistance when rig's water pumps failed.



3:30 p.m. Wednesday: Trouble

After cement was allowed to set, the plug was drilled with the first 9⅞-in. bit. This bit made only 906 ft. before a ceramic jet washed out. Resulting pressure drop spelled danger so string was pulled.



4:00 p.m. Thursday: Drilling at 7,300 ft.

Dixie's big pumps are running against 3,000 psi. In hole, jet velocity through three 13/32-in. jets is 510 ft. per second. Annular velocity is 200 ft. per minute.

4:45 p.m. Thursday: Second trip below surface pipe

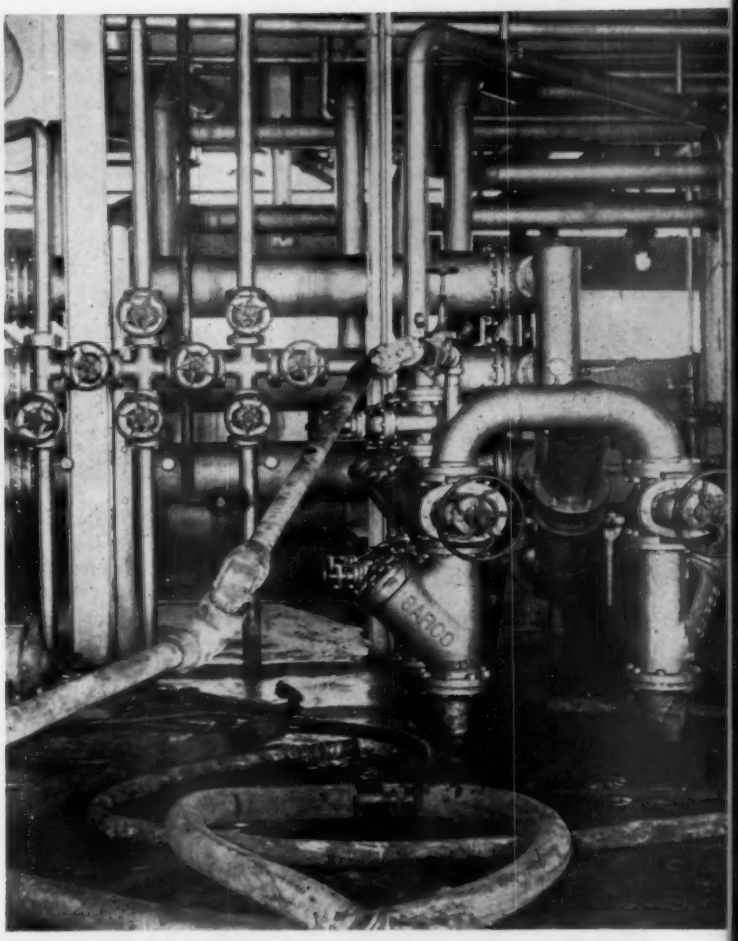
The 9⅞-in. bit has run 18 hours and made 4,420 ft. Weight on bit was 40,000 to 60,000 lb. and rotary turned at 140 to 180 r.p.m. There had been no indication of trouble which followed.

5:00 p.m. Thursday:
More trouble

Cones had been run entirely off the second 9⅞-in. bit. At fast rotary speed, high bit weights, and great circulating rates, rotary power is often more than 400 hp. As a result, locked cones on bit can't be detected sometimes.

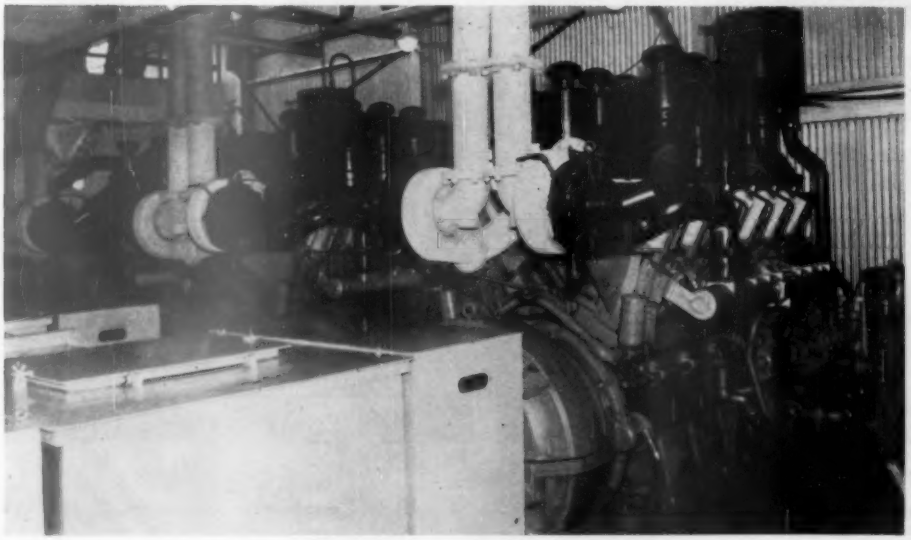
9:00 p.m. Thursday:
Still more trouble

Drilling on cones left in hole by previous bit caused this bit to fail after drilling only 1 hour and making 65 ft. of new hole. David Jones, Gulf's drilling foreman, points to cracked cone.



7:30 a.m. Friday: Trouble once again

Water circulation to engines and draw-works brakes stopped when pump-motors shorted out. Three hours were lost before cementing barge can be brought to location so its pumps could put water into heat exchangers to cool rig engines.



8:00 p.m. Friday:
Engines run against load at 9,200 ft.

Dixie Rig 3 boasts 3,300 hp. in these three main drilling engines. There is a turbocharger on each bank of cylinders of the big V-12 diesels. Mechanical compound connects engines to pumps, draw works.

7:00 a.m. Saturday: Last bit is in the hole

Here Ray Gross, Gulf area drilling engineer, watches returns from the well. Pumps are taking suction on the bay but return fluid weighs 10.5 lb. per gal., having picked up 2 lb. per gal. of solids in the hole.

(Continued from page 93)

Timbalier Bay. Drilling time to 10,000 ft. has been trimmed in almost each successive week by rigs under day-work contract to Gulf. Only a few days after the 3-day, 20½-hour record was set, the same rig drilled to 10,000 ft. in only 3 days, 16 hours. And, a new record was in prospect on a third well at the time of this writing.

The 5-S State Lease 1,773 described here is one of three stratigraphic tests drilled by Gulf in the area. Seismic reflections here are poor due to the unconsolidated layers of clays, sands, and shales. The test holes are drilled to 10,000 ft., electrically surveyed, and abandoned. (For other Gulf-set records in the area, See The Oil and Gas Journal, January 11, 1960, p. 44; May 23, 1960, p. 146; and July 18, 1960, p. 66.)

What records mean. The fast drilling at Timbalier Bay is merely a means to the real goal: finding and developing the oil reserves there at reasonable cost. How well has Gulf done in keeping the cost reasonable? Very well, judging by these indications:

In 1959, average cost per foot of hole drilled in the Timbalier area was $26.84. Wells drilled in this period averaged 11,554 ft. total depth and average mud cost was $1.85 per foot. Drilling time to 10,000 ft. ranged around 12.9 days.

Gulf began a concerted effort to reduce costs in the area in February 1960. As a consequence of this program, the average well drilled in Timbalier Bay during the second quarter of 1960 cost only $16.63 per foot and took only 7.54 days to reach 10,000 ft. Average mud bill was reduced to $0.68 per foot and total depth averaged 10,800 ft.

With more experience, costs have been cut still further. During the first part of the third quarter, average cost had been cut to $13.87 per foot and the wells reached 10,000 ft. in 5.41 days. Mud cost remained at about $0.68 per foot with average total depth being 10,550 ft.

3:30 p.m. Saturday: Last single is added to string

The total depth of 10,000 ft. is reached a few minutes later, making total elapsed time since spudding only 3 days, 20½ hours—a new record.

5:30 p.m. Saturday: Heading for home

While the rig prepares to move to the next location where the next week still another record was set (3 days, 16 hours), Gulf men journey to Morgan City office by helicopter.

These men did the job...

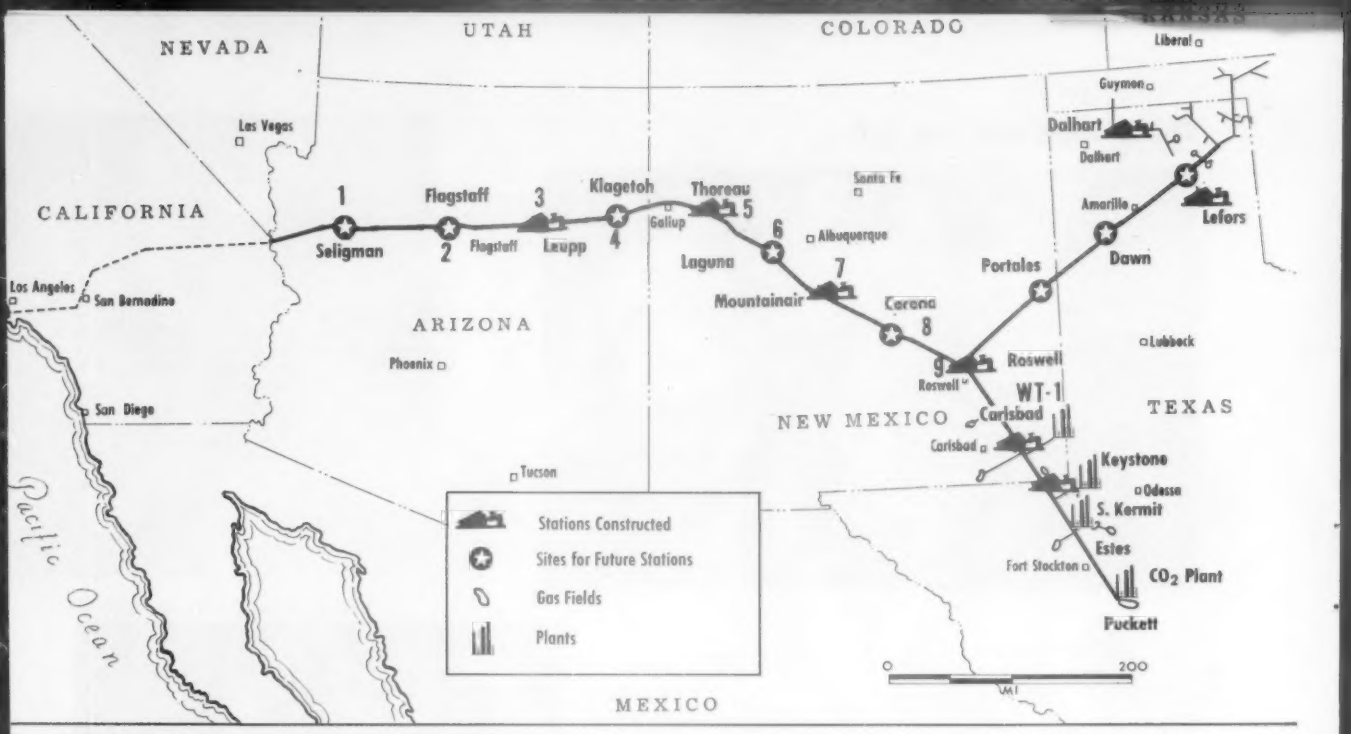
MEN who actually did the work are members of the crews of Dixie Drilling's Rig 3. On daylights for the job were: H. W. Merkel, driller; E. A. Moss III, derrickman; M. P. Thomas, motorman; W. L. Kirkpatrick, helper, J. H. Buxton, helper, and D. O. Rollins, Jr., helper.

ON EVENING TOUR are: J. E. Rawls, driller; Johnny Hester, derrickman; John Galjour, helper; Ira Cochran, helper; and Euris Plaisance, helper.

ON MORNING TOUR are: W. S. Colston, driller, W. G. Romero, motorman; Dudley Pertuit, derrickman; C. T. Danos, Jr., helper; and J. R. Stokes, helper.

And these men set the next goal...

IN MORGAN CITY, the three Gulf men most directly connected with the drilling of the record-breaking well confer on new ways to trim time and cost. From left: Ray Gross, area drilling engineer; V. D. Stone, area drilling foreman; and David Jones, Jr., drilling foreman.



TRANSWESTERN natural-gas pipeline consists of a 30-in. main line from Roswell, N. M. to the California border, fed by two laterals connecting at Roswell. Fig. 1.

How the new Transwestern line was designed and built

The author...

NORMAN F. BLUNDELL, chief engineer of the Gulf Interstate Co., started his career in the oil and gas business in 1935. His association with gas-transmission pipelines began in 1943 as a resident engineer for Panhandle Eastern Pipe Line Co. In 1950, he participated in the design and construction of the Trunkline Gas Co. as assistant chief engineer. Prior to his association with Gulf Interstate Co., he was vice president and chief engineer of Gulf Interstate Gas Co., in charge of design and construction. He is a graduate civil engineer of the University of Nevada and an active member of the ASA subcommittee on design standards for the gas industry.

ON AUGUST 9, 1960, Transwestern Pipeline Co. began initial deliveries of gas to Pacific Gas Lighting Supply Co. at the Arizona-California state line. Opening of the valves at Needles marked the end of construction and the beginning of operations. The 2,000-mile-plus line was completed in the record time of 9 months, 12 days after FPC acceptance.

Prime objective of the line is to provide California with a new, dependable source of Texas gas. To this end, a widespread lateral and gathering system has been constructed to connect Transwestern's 30-in. main line at Roswell with the gas-producing areas of Permian basin and the Texas Panhandle (Fig. 1).

A 24-in. lateral connects each of the gathering systems with the main line at Roswell. From here, the 30-in. pipeline swings northwest into northern New Mexico. Near Gallup it turns due west across Arizona to the California State line where it ties onto the new PGL pipeline.

System capacity. The daily design capacity of the system is 300 M.M.c.f.d., with reserve built into the system to give 350 M.M.c.f.d. throughput for peak day demands. The ultimate design capacity of the single-line system, with all compressor facilities installed, is 640 M.M.c.f.d.

Of the total 161,000 hp. to be installed for the ultimate design, only 35,000 hp. has been installed, 28,000 hp. on the main line and 7,000 hp. on the West Texas lateral (see side box for details).

The Transwestern main-line stations are numbered from the Arizona-California state line eastward. Stations 1, 2, 4, 6, and 8, are for the ultimate flows. Stations 3, 5, 7, and 9 are now installed.

Elevation Changes

The long distance between station 3 and the Needles Terminal, some 230 miles, is considered somewhat unusal for a gas line, particularly when Transwestern's contract calls for a terminal pressure of 800 psig. at Needles. The reason for this long spacing and the spacing between all main line stations, is the difference in elevations of the stations.

The Colorado River is the point of lowest elevation on the system, some 400 feet (see Fig. 1). Station 3, the first station installed east of the river, has an elevation of 5,000 ft. In between these two points is Shultz Pass, the highest point on the system, some

8,200 ft. However, the net difference in elevation between station 3 and the Colorado River is 4,600 ft.

For static conditions and a pressure of 1,008 psig. at station 3, the pressure at the river would be 1,132 psig. The drop in elevation accounts for the increase in static head or pressure, at the river. The spacing of the stations has been adjusted to take advantage of the elevation changes along the main line.

Elevation profile. To illustrate the importance of elevation changes on the Transwestern system, a section of the 30-in. main line between station 6 and station 7 with an elevation profile is shown as Fig. 2. The distance between these two stations is 80 miles, slightly shorter than most economical spacing for a pipe line in normal flat terrain with the same quality pipe.

Beginning at the left side of the drawing, station 6 has an elevation of 6,000 ft. The lowest elevation in this section is at Rio Grande River at an elevation of 4,800 ft. The high point is found just west of station 7 at an elevation of 7,020 ft. Station 7 has an elevation of some 6,900 ft. For static conditions and a pressure of 1,008 psig. at station 7, the pressure at the low point is 1,073 psig.

With a discharge pressure of 1,008 psig. at station 7 and the design flow of 300 M.M.c.f.d. the pressure at the low point, the Rio Grande River, is 1,038 psig., well above the allowable working pressure of the pipe. With the same discharge pressure at station 7, but at a reduced flow rate of 200 M.M.c.f.d., the pressure at the river is 1,052 psig.

Obviously, the change in elevation on this section of line results in overpressuring the line. A pressure-regulating station was set up at main-line valve (MLV) 7008 to throttle the flow so that the pipe would be pressured to only its allowable at the river. Since the amount of cut to be taken by the main-line valve varies with the flow and pressure, it must be adjusted to suit actual operating needs.

To further protect the pipe at the river, a large pressure-relief valve was installed to relieve the pressure in the pipe should the pressure regulation at MLV 7008 fail to function properly.

The manner in which the elevation changes have been applied is novel for a gas line.

Line Pipe

This is the first pipeline that has used the new high-strength API-5LX-56 pipe exclusively for its entire main line. This is not the first major application, however, for it was used in 1958 during the 350-mile looping program on what is now known as the Columbia Gulf Transmission System.

The handling and welding techniques used on that program were reused on the Transwestern line without any unusual difficulties. Standard welding rods were used for the various weld passes, and during the cold winter months, the pipe was thoroughly preheated before welding.

Why X-56. The selection of X-56 was based on economics. The pipe cost 4% more than the same pipe in X-52 grade when the Transwestern pipe was purchased. However, the 56,-000-psi. yield strength is some 8% higher than the 52,000-psi. yield strength of the cheaper pipe. The net result is a saving of 4% in pipe material.

If the higher yield strength of X-56 had been used to reduce wall thickness, an additional 2% would have been saved in material cost. Actually, the best method of using the X-56 pipe is to take advantage of the higher operating pressure and achieve a 10% increased throughput for the ultimate design flow.

To achieve the same ultimate throughput using the X-52 pipe, an additional 41,000 hp. would have had to be installed over that required for the pipeline using X-56 pipe. The over-all saving to Transwestern amounts to some $16,000,000. A further saving with the X-56 pipeline system would be a $1,000,000 saving in operating costs for the extra 41,000 hp. that would be required with the X-52 pipeline system.

Engineering. In early 1959, Gulf Interstate Co. received an engineering contract to design and engineer the complete system, to purchase materials and right-of-ways, to let construction contracts, and to inspect and supervise the actual construction of the Transwestern system.

Construction contracts for the pipeline were divided by Gulf Interstate

Main features of Transwestern line

Line Length

A TOTAL OF 2,000 miles plus, all diameters, from West Texas and Panhandle gas fields of Texas and Oklahoma to the Arizona-California state line, as follows:

- 30-in. Main line—644.1 miles.
- 24-in. Panhandle lateral—288.1 miles.
- 24-in. West Texas lateral—163.8 miles.
- 20-in. West Texas lateral—61.2 miles.
- Panhandle gathering system: 642.8 miles of 4 to 16-in.
- West Texas gathering system: 218.5 miles of 4 to 16-in.

Capacity

INSTALLED: 300 M.M.c.f.d. with peak days of 350 M.M.c.f.d.

ULTIMATE: 640 M.Mc.f.d. for single line and all stations installed.

Significant Mileages and Elevations

Station	Name	Miles to next installed station	Elevation, (ft.)
WT-1	Carlsbad	79	3,500
9	Roswell	118	3,600
7	Mountainair	140	7,000
5	Thoreau	157	7,300
3	Leupp	230 (to Calif. line)	5,000

Lowest elevation: Colorado River, 400 ft.
Highest elevation: Schultz Pass, 8,200 ft.

Compressor Stations

INSTALLED: Four 7,000 hp. on Main line; one 7,000 hp. on West Texas lateral; one 2,640 hp. in Panhandle gathering system; one 1,740 hp. in West Texas gathering system.

ULTIMATE: Nine 14,000 hp. on Main line; two 7,000 hp. on West Texas lateral; three 7,000 hp. on Panhandle lateral.

Here are the men who manage Transwestern . . .

W. K. WARREN

MILLS COX

J. R. BUTLER

W. B. PADON

N. C. TURNER

P. F. McBRIDE

WILLIAM K. WARREN, chairman of the board, is a native of Nashville, Tenn. He organized Warren Petroleum Co., in 1922 and is chairman of the board and chief executive officer of its successor, Warren Petroleum Corp. He is president, American Natural Gasoline Corp.; director and member of the executive committee, Gulf Oil Corp.; director, Warren International Corp.; director, American Life Insurance Stock Fund, Inc., and director, First National Bank & Trust Co., Tulsa. He is president, Inetrnational Petroleum Exposition; director, API; member Mid-Continent Oil & Gas Association; member and past president of oil's Twenty-Five Year club.

MILLS COX, president, has a BA from Baylor, 1923. He attended Texas A&M and Yale University Graduate School of Business Economics. He began work with Mills Bennett interests. He left as vice president, Mills Bennett; president, Liberty Pipeline Co., and vice president, Carter Drilling Co., to join the Army Air Corps. He joined H. L. Hunt in Louisiana in 1946. In 1948 he went to Texas Eastern Transmission Corp., became vice president in 1950 and was also made vice president, Texas Eastern Production Corp. In June 1952, he was elected vice president of Wilcox Trend gathering system, acquiring reserves and negotiating purchases for Texas Eastern.

JOHN R. BUTLER, chairman, executive committee, director, and secretary-treasurer, has a BA from Miami, O., University. He was with Ohio Oil Co., and Old Ocean Oil Co. in 1946. In 1948 he organized J. R. Butler & Co., consultants, which later became Butler, Miller & Lents. He is president, Reef Corp. and J. R. Butler & Co., Houston, and director and former president, Butler-Johnson, Inc., drilling contractors, Shreveport. He is a member of IPAA, API, Texas Mid-Continent Oil & Gas association, TIPRO, and a director, Bank of Texas.

WILLIAM B. PADON, vice president, administration, is a graduate of Notre Dame, finance, and Harvard University Advanced Management Course. During summer vacations from 1939 to 1942 he worked with Warren Petroleum Corp. He spent 44 months in service and rose to captain in Coast Artillery anti-aircraft. He rejoined Warren in 1946 in the gasoline-sales division. Later he headed special-products sales. He was elected vice president in charge of projects and planning on June 1, 1956, and was made a director on Jan. 1, 1959. He is a member of the API, the NGAA and the Pipeliners Club of Tulsa.

NED C. TURNER, vice president, engineering and operations, is a graduate of Ohio State with a BS in chemical engineering. He first worked as a gas chemist for Baltimore Gas Engineering Co. In the early 30's he worked 2 years in Russia for the government. During the war he supervised engineering of avgas plants for Jones & Laughlin as part of the Defense Plant Corp. He joined Hudson Engineering Corp. and became a vice president. He supervised natural-gas and petrochemical projects in the U. S., South America, and Middle East. In Pakistan he directed the engineering facilities for the Sui Gas Transmission Co. He was a pioneer in the development of gas chromotography.

PAUL F. McBRIDE, operations manager, received his BS in chemical engineering from Texas A&M in 1948. He was first employed by United Gas Pipeline Co., working on the design and construction of natural-gas facilities. In the fall of 1951 he became chief engineer, Algonguin Gas Transmission Co., Boston. He joined Fish Northwest Contractors, Inc. as assistant chief engineer when it began construction of the Pacific Northwest pipeline system. Later he was assistant superintendent of construction. In 1956 he was employed by Pacific Northwest Pipeline Corp. as chief engineer and in 1958 was made general superintendent of operations, responsible for operation and engineering.

---

among three prime contractors: H. C. Price Co. and Houston Contracting Co.—30-in. main line and 24-in. and 20-in. laterals; Sheehan Construction Co.—over-all gathering systems; R. H. Fulton & Co. and Western Construction Co.—subcontracts on lateral system.

Altogether, 11 spreads were used, of which 7 were main-line spreads. Peak manpower during construction of the line reached as high as 3,100 persons. Gulf Interstate had some 300 engineers, inspectors, and material clerks in the field during construction.

Construction

Actual construction began in November of 1959, and almost immediately, the spreads encountered rugged terrains and bad weather.

One of the big factors in the unusually good progress that was achieved in spite of the various construction problems, was double-jointing of the main-line pipe. Both Houston and H. C. Price set up double-jointing yards, and almost all of the 40-ft. joints were double-jointed.

All automatic welds in the double-jointing yards were X-rayed. This came to more than 30% of the field welds, and resulted in some 65% of all pipeline welds being X-rayed. All welds in Class 2 and Class 3 locations were given a 100% X-ray examination.

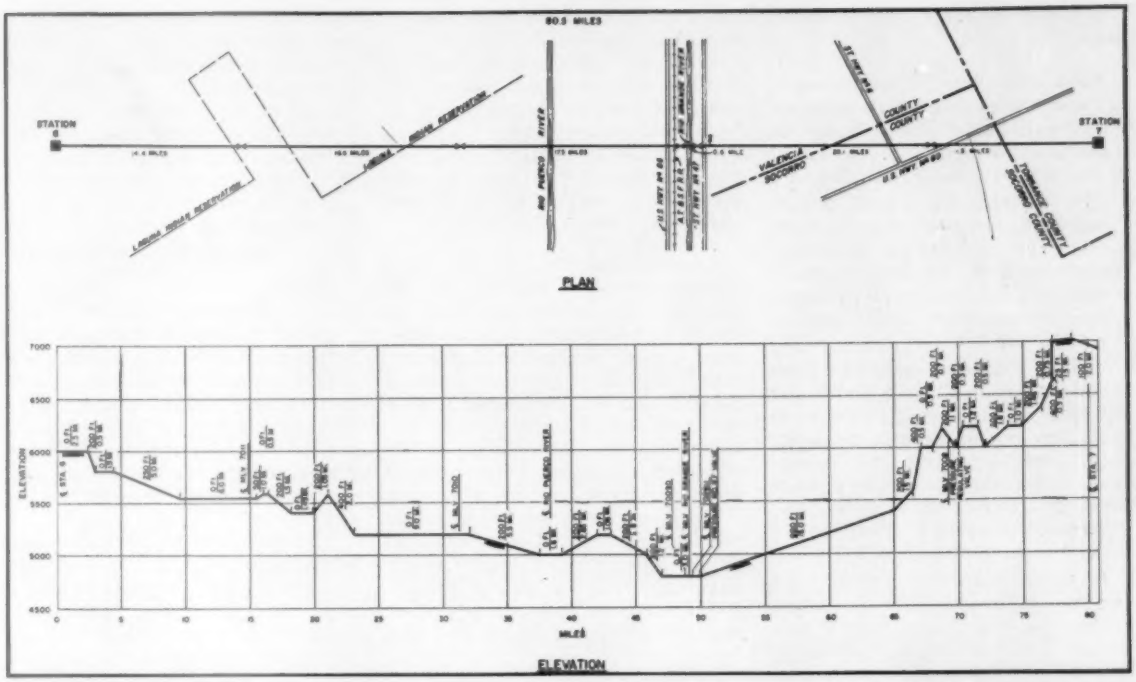
This pipeline has received the highest percentage of X-rayed welds ever obtained on a project of comparable size.

Troubles. Rock was encountered in the mountainous country, and at times, backhoes were worked 20 hours a day removing rock blasted loose in the ditch. Because of the rock, an extensive ditch-padding was necessary for ditch bottom and backfill. At times, the dirt padding was moved to the ditch from several miles.

But rock was only one type of terrain that had to be crossed. High, shifting sand dunes were problems near Monahans, Tex. Heavy rainfalls in the Panhandle areas often flooded the ditches and overflowed to form lakes of several acres.

Four major rivers had to be crossed. The Pecos (twice), the Canadian, the Rio Grande, and the Colorado lay in the path of Transwestern. The Pecos and Colorado crossings were made under the rivers. Both Pecos crossings have two 20 by ½-in.-wall pipelines. A double 24-in. crossing with ½-in.-wall pipe was made on the Colorado.

The Canadian and Rio Grande rivers were crossed with aerial bridges. A single 30-in. line was placed on trestle-bent pipe piles driven some 130 ft. into the river beds. Although the Rio Grande was only some 300 ft. wide, the aerial span actually covered 3,000 ft. to pass over irrigation canals and flood-control levees on either side of the river. The Canadian River aerial crossing is 6,120 ft. long.



PLAN AND ELEVATION of 80-mile section crossing the Rio Grande in mountainous area of New Mexico between Laguna station 6 and Mountainair station 7 where special provision had to be made for unusual pressure conditions. Fig. 2.

Line features. Transwestern is designed for onstream pigging with full-opening hypersphere valves on the main line. Pig traps and launchers are located at each main-line and lateral compressor-station site. All gathering lines of more than 1 mile also have traps and launchers for onstream pigging.

The maximum operating pressure on the 30-in. line is 1,008 psig. The 24-in. lateral line will operate up to 1,048 psig. The 60 miles of 20-in. line is limited to 1,052 psig.

All lines have a 3/32-in. coating of hot-applied coal-tar enamel, glass-wrapped and protected with kraft paper, except for the first 25 miles on the discharge side of each compressor station where high-melting-point enamel and felt are applied to withstand higher gas-discharge temperatures. The gathering lines in Puckett field were all internally coated in place with a thin-film epoxy-resin plastic coating to protect the pipe against effect of large quantities of CO_2 and H_2S present in the gas.

Field Processing

Transwestern has a large gas-treating plant in Puckett field to process 180 M.M.c.f.d. of gas to normal pipeline specifications. The plant was designed and built by Brown & Root. The plant uses the Giammarco-Vetrocoke process, first such installation in the United States.

Much of the gas is obtained directly from gas wells. By the time Transwestern has obtained FPC certificates to connect all of the wells already alloted, the total number of wells will certainly exceed 200 and should go considerably higher. Some 90% of these wells need package, skid-mounted dehydration units, with the orifice-meter facilities.

Dehydration. A permanent molecular-sieve-type dehydration unit to handle 25 M.M.c.f.d. is in service at Monument gas field. The Keystone compressor station has an amine-desulfurization and glycol-dehydration unit to handle a maximum of 75 M.M.c.f.d. A solid-dessicant dehydration plant is installed at the Dalhart station in the Panhandle gathering system.

Two separate check-measuring stations are installed in the lateral system. One station is centrally located at the compressor station in Roswell, one at the future compressor-station site at Pampa.

The Pampa station uses conventional orifice-meter runs. Two of the meters are installed on each lateral as it enters the station. Both of these meters are installed in 10-in. runs and are designed so two meters in parallel can handle a maximum flow of 320 M.M.c.f.d. on each lateral, the ultimate condition.

The Roswell station uses the new Rotron vortex-velocity mass flowmeter.

Control at Needles

The main sales-measuring station at the Needles terminal has been designed to ultimately accommodate 24 10-in. orifice-meter runs, of which 7 are presently installed. Two air-conditioned buildings have been constructed at the meter station, one to house the orifice meters and a second larger building to house office, gas-measurement laboratory, and automatic-control facilities.

The station was designed for either automatic or manual operation and can be controlled either remotely by the dispatcher in Roswell or locally. The heart of the control system is composed of three main items: Flow computer, flow controller, and control valve. The telemetering system links these components at the station and connects Roswell with the station.

Computer. The flow computer was designed by Computers, Inc., to continuously compute the flow through the station. This unit has an accuracy of 0.1% of full-scale flow or an equivalent accuracy of 1 M.c.f.d. It receives inputs of static and differential pressure, flowing temperature from one meter run, and the number of runs in service. Another adjustable input adds necessary orifice factors to compute orifice flow as required by the standard AGA equation.

This adjustable input is an equivalent factor for the size of orifice, spe-

cific gravity, pressure and temperature bases, etc.

Flow controller. The output signal of the computer is fed to an electronic recorder-controller with a motorized index to allow local or remote setting of the index to the desired flow rate.

The instrument has a 150% proportional band, automatic reset, and rate action. The 3 to 15-psi. pneumatic output signal of the flow controller is sent to a full-opening 20-in. hypersphere control valve, downstream of the meter runs.

Two of the seven meter runs now in service, numbers 6 and 7, are equipped with electric-motor-driven valve operators to maintain the differential pressure on the five manual runs within the differential-pressure limits of 20 to 80 in. of water. This differential pressure is sensed on the manual runs, numbers 1 or 2.

In operation, one or both of these two runs will remain open at all times. If the flow falls, one or both of runs 6 and 7 will automatically close to maintain the differential-pressure control limits. If the flow continues to fall and the minimum differential-pressure limit is reached, the control panel at Needles and in Roswell will flash a light. Station personnel then close sufficient manual runs to raise the differential pressure on all runs in service, including runs 1 and 2, to satisfy the differential-pressure control limits.

The automatic switching equipment is incorporated within the master control panel, along with the encoders and telemetering equipment. The master control panel contains the flow controller and computer and the recording and indicating devices. The static and differential pressures and the pressure downstream of the hypersphere control valve, the computed flow, and gas temperature are all recorded at Needles.

Indicating lights mounted on the Needles control panel indicate the status of station control; remote or local, automatic or manual; communication circuit on battery standby; set-point deviation; orifice differential pressure high, and the orifice differential pressure low.

Control board. The control board in Roswell displays for the dispatcher the necessary flow information that is telemetered in from the Needles measuring station. The telemetering equipment encodes that flow data at Needles, and it is transmitted to Roswell over Bell Telephone leased d.c. control circuits. This circuit is designed on a time-share basis so data is sent and received on the same line.

Upset or abnormal conditions at Needles can initiate data transmission at any time from the station to the dispatcher.

This information is received in Roswell and displayed by indicating lights:

(1) Station on remote control, (2) station on local control, (3) station on automatic control, (4) station on manual control, (5) communication circuit on battery standby, (6) flow-set-point deviation, (7) differential pressure high, and (8) differential pressure low.

This information is displayed in digital form:

(1) Rate of flow through station, (2) number of meter runs in service, (3) station inlet pressure, (4) orifice-meter differential pressure, and (5) station pressure after flow-control valve.

The dispatcher can select where the station is to be controlled from, either remote or local and how the station is to be controlled, either automatic or manual. For the normal remote automatic-control situation, the dispatcher in Roswell merely pushes the button to place in service the automatic flow-control panel at Needles, and then he selects the type of control to be exercised, automatic or manual control of the meter runs.

The data automatically flashed back to the dispatcher allows him to observe the progress of the automatic execution of his orders. He has the ability to demand data recall at any time should a mistake be made in transmission.

Compressor Stations

One of the more interesting features of the pipeline is its automatic compressor stations. Transwestern is the first and only pipeline system that has its main line powered entirely by centrifugal compressors. It also is the first pipeline to use four-cycle engines exclusively at all of its main-line stations.

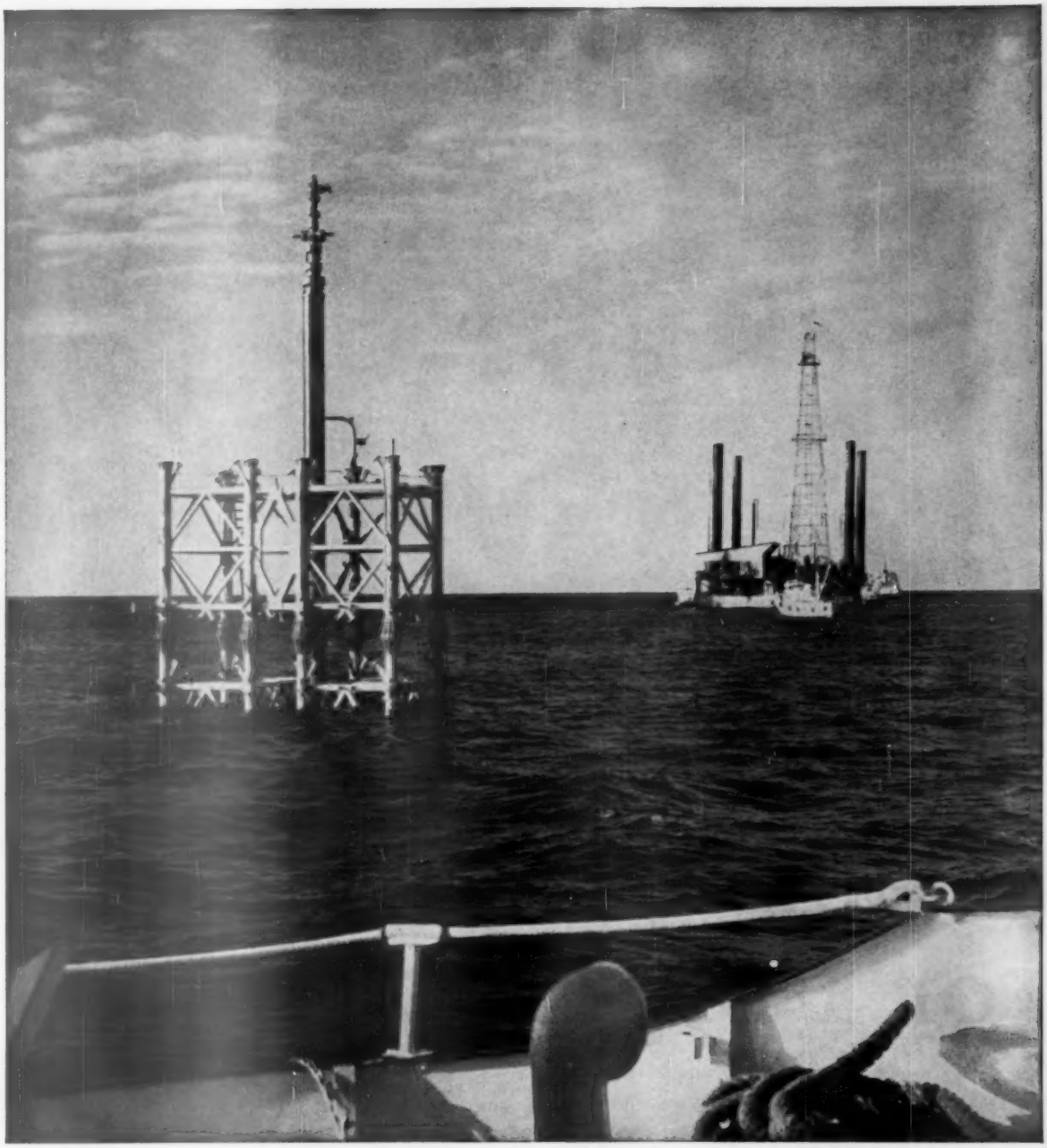
The engines are 16-cylinder, fully turbocharged, high-compression, high-performance gas engines rated at 3,500 hp., 327 r.p.m., and a brake mean effective pressure of 127 psi. The guaranteed fuel consumption of this engine is 6,140 B.t.u. per b.hp.-hr. Two different aerodynamic assemblies are used because of the effects of the change in elevations at the various locations. Station 3 and WT-1 will have aerodynamic assemblies to match a 31-in. diameter impeller, while the other main-line stations will have 29-in. impellers.

The high-speed centrifugal compressors rated at 5,500 r.p.m. are matched to the slower-speed engine through a two-stage high-speed gear increaser.

This particular combination engine-gear-compressor was selected for several reasons. For the engine:

1. Better efficiency: i.e., over 11% less fuel required for the four-cycle engine over the best two-cycle engine available at the time when Transwestern was designed.

DALHART, TEX., station during construction. This is one of Transwestern's two-stage reciprocating compressor stations.



ABU DHABI

A well head in the Persian Gulf. In the background, the barge "Adma Enterprise" which is currently drilling beneath the waters of the Gulf. The results are sufficiently encouraging to warrant the preparation of facilities for regular production. This stage should be reached by mid-1962.

BP

Steel

for Strength
. . . Economy
. . . Versatility

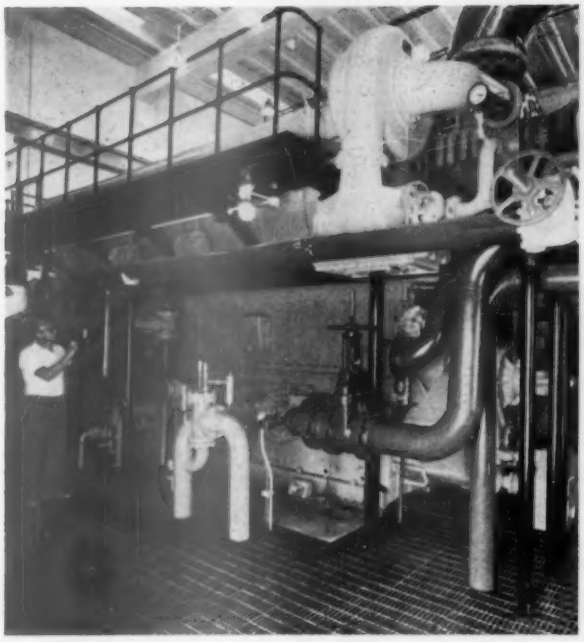
Casting... or Forging?

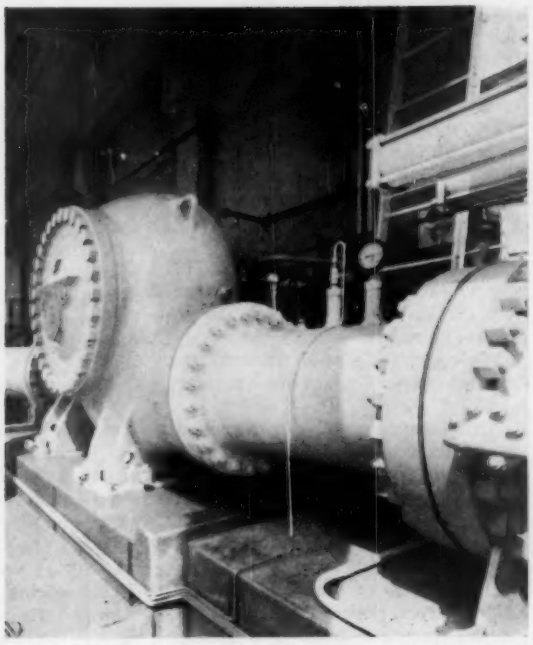
From the look of it, most people would probably guess casting. But it's a forging. Which proves a point. Many parts *look* too complicated for forging, but actually aren't. By careful selection of parting line, close trimming, and punch-outs, we're often able to forge parts you'd never expect to obtain as forgings. If you have such a part (and would welcome the strength and economy of forgings), send us a finished print. We'll be glad to study it and tell you frankly whether or not we can forge it. If we can, you can count on us for fast delivery.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL





ENGINE ROOM (left) at Mountainair station 7 and a centrifugal compressor (right) at Carlsbad station WT-1., showing typical equipment of Transwestern's main-line stations each having two 3,500-hp. reciprocating engines driving centrifugal compressors. High-pressure gas piping is all outdoors and separated from engine room by 12-in. poured-in-place concrete fire wall.

2. Greater flexibility: The prime mover for a centrifugal compressor must be as flexible as possible. The engine was the best available when Transwestern was designed.

3. Easier starting of the engine: A four-cycle engine is inherently easier to start than a two-cycle engine. Transwestern's compressor stations are fully automatic and must have the highest percentage of successful engine starts that can be achieved.

Centrifugal compressors were chosen over reciprocating compressors for Transwestern's automatic compressor stations of these advantages:

1. No valve losses and reduced maintenance costs: Centrifugal compressors do not have compressor valves to introduce friction losses. Compressor-valve breakage is an ever-present maintenance problem at reciprocating - compressor stations. Thus, the centrifugal compressor is better suited for an unattended automatic compressor station.

2. Greater compression efficiency: The stations will operate at compression ratios up to 1.35. For this range, the centrifugal compressor is more efficient than the reciprocating compressor.

3. Best suited for automation: Centrifugal compressors properly matched to their prime mover are inherently better suited to automation, as simple speed control is fully satisfactory to control flow and pressure.

4. High-flow, low-head characteristics: Because of these inherent characteristics, centrifugal machines are better adapted to the low-compression-ratio, large-volume-throughput concept designed into Transwestern's modern pipeline system.

The engines and gear sets at main compressor stations are inside a 50 by 56-ft. fireproof precast concrete building with pressurized ventilation. A 12-in. fire wall separating engine from compressor was poured in place. Thus, the compressor and the high-pressure yard piping are located outdoors to provide maximum safety for the stations.

The compressors are placed under a precast concrete roof. The gas piping is all aboveground, which facilitates inspection and repair, and gas piping and main building are expandable. Two mechanical filters are welded in the suction-gas piping to remove bits of debris that may be in the piping before it enters the compressors. One of these filters is located in the suction-gas piping to each of the compressors.

A new type of oil-bath filter is used to purify combustion air for the engines.

Control Systems Monitored

The control systems are constantly monitored to insure their proper operation. Each important function in the various control systems is independently monitored by a safety device that is so interlocked with the control systems that should a control device fail to function properly, the safety monitor shuts down the unit.

Consider the important discharge-pressure controller at the stations which controls the speed of the engines. This unit is an electronic recorder-controller, with a digital-input set-point servo. The index servo was designed to record the set-point positional data as received from the dispatcher and to drive to the new set point as dictated by the dispatcher.

At the new set point, the instrument then transmits its new position in digital form. A separate instrument measures the actual discharge pressure and compares that pressure with the set point. If this instrument, independent of the discharge-pressure controller, detects a deviation between the independently measured pressure and the set point, that instrument activates the set-point deviation light and this signal is telemetered to the dispatcher to take correcting steps.

Thus, the independent instrument constantly monitors the main controlling instrument to insure that it is doing the job properly.

Engine control. Engine-control panels with built-in sequencing equipment are designed for complete sequence startup, continuous operation, and complete sequence shutdown. Within the sequence - startup and shutdown operation, the control systems and safety devices are so interlocked that

should a malfunction occur, the engine will shut itself down. In general, these safety devices are classed into three major groups: alarm, shutdown restart, and shutdown lockout.

The more important functions will result in a shutdown-lockout situation. Thus, the dispatcher cannot restart the engine until the lockout has been corrected by the station personnel.

These types of functions are: (1) fan vibration, (2) engine vibration, (3) gear vibration, (4) compressor vibration, (5) gas-piping vibration, (6) engine-oil pressure low, (7) turbo-oil pressure low, (8) gear-oil pressure low, and (9) engine-crankcase pressure high.

A number of possible malfunctions will result in a shutdown but will allow the engine to be restarted. Quite often, a function will correct itself during the shutdown or restart of the unit. Therefore, the dispatcher is allowed to restart the engine.

These types of functions are: (1) Engine-valves position false, (2) engine-oil pressure high, (3) gear-oil pressure high, (4) engine-oil temperature high, (5) jacket-water temperature high, (6) starting-air temperature high, (7) gear-oil temperature high, (8) compressor-case temperature high, (9) compressor thrust-bearing temperature high, (10) discharge-gas pressure high, (11) compressor seal leakage, (12) seal-oil-accumulation-tank level high or low, (13) seal-oil-tank level high or low, (14) engine-oil level high, and (15) engine overspeed.

The third class of functions are continuously monitored and if an unusual condition is detected, an alarm is sounded. Generally, these functions are not those which when first detested warrant shutting down the engine. If left unattended, however, the controls will then shutdown the unit whenever a dangerous condition is detected.

This class of functions is: (1) Seal-oil differential pressure high, (2) seal-oil warning level, (3) engine-oil level low, (4) gear-oil level low, (5) jacket-water surge-tank-level low, and (6) oil cooling-water surge-tank-level low.

Safety. A number of safety devices monitor the timers in the sequential startup and shutdown. Should any element of the series sequence take longer than the predetermined time, the independent safety timers will break into the sequence and shut down the unit.

In all of these functions, an annunciator tab is displayed to identify the malfunction.

The station-control panels have similar safety devices and monitors built into their control circuits that will shut down the station safely. Conditions that would result in closing of the firegates and the firedoors and ventilators in the engine and auxiliary building are: discharge-gas temperature high, suction pressure low, pipeline break, and an explosive gas mixture within the engine room.

Fire protection. If a fire should be detected in the engine or auxiliary rooms or within the compressor area, the engines and electrical generators would be shut down safely, all firedoors and roof ventilators would close, the firegates would close and the yard gas piping blowdown. A water fogging system has been installed in the engine room and a CO_2 system for the auxiliary room as fire-fighting equipment.

A gas analyzer is constantly monitoring the auxiliary and engine rooms. Should a gas-air mixture be detected that is 40% of the lower explosive limit, an alarm would be sounded. Should the mixture concentration increase to 60% of the lower explosive limit, the station would be automatically shut-down and placed in a safe condition.

Each of Transwestern's stations are completely self-sufficient. Auxiliary engines at the stations generate sufficient power to supply all of the electric power requirements. Small standby auxiliary engine-generator sets have been installed to supply the control equipment. If the small generator sets do not pick up the emergency load, the equipment is then automatically switched onto the standby battery power.

The battery supply is designed to operate the station for at least 8 hours, at which time it would be necessary to place the stations on manual operation.

The station control equipment is divided into three separate, but interlocked, control boards. One for general station facilities, and one for each engine at the station. To each of these panels are sent the various data from the engines and station control equipment. Some of the data are merely indicated.

The more important data are recorded in the proper control panels: Discharge and suction pressures, set point, gas-flow rate and operating speeds of the engines. A large-diameter orifice-meter run has been integrated in the station suction-gas piping and data from this orifice-meter run are fed into an automatic flow computer that continuously computes the flow through the station.

"The dispatcher can select which station he wishes to send instructions to. He can alter the discharge-pressure set point, start or stop the engine, and have these data sent when he presses the data-send button."

Roswell Control Center

The Roswell dispatching center is the vital control point for the Transwestern system. All data from the automatic stations are channeled into this central point to be displayed on central control panel. The dispatcher is provided with a console desk in front of the curved central control panel. The controls provided the dispatcher are mounted on a console.

To send new instructions to the automatic stations, he merely pushes the appropriate button on the console and observes the execution of his order on the panoramic control board as the order is executed and data is telemetered from the stations back to Roswell.

The dispatcher can select which station he wishes to send instructions to. He can alter the discharge-pressure set point, start or stop an engine, and have these data sent when he presses the data-send button. He can cancel these data immediately after sending should they be in error—with a code-cancelling button. He is able to demand data recall as he chooses.

Dispatcher function. Thus, the ability of the dispatcher is restricted to merely dispatching the line. The operation of the station is left strictly up to the automatic controls at the stations. The station controls are fully capable of operating the stations in a safe manner and if trouble develops on an engine or to a station, the built-in safety devices will protect the station and the equipment installed.

The dispatcher, however, is continuously advised of the situation at each controlled point on the system through the data transmitted from those points to Roswell.

The information displayed from the stations for the dispatcher is either indicated with lights on the control board or displayed in digital form.

These data are: (1) set-point position, (2) discharge pressure, (3) set-point deviation (indicator light), (4) suction pressure, (5) station computed flow, (6) engine r.p.m., (7) if the engine is down, (8) if the engine is on the line, (9) engine remote control (indicator light), (10) engine local control (indicator light), (11) engine on manual control (indicator light), (12)

New steels are born at Armco

from vending to mending . . .

Sheffield has the right bolts

Making things or repairing things, there's a Sheffield bolt for every purpose. Manufacturers of vending machines use Sheffield bolts. So do makers of thousands of other products. So do farmers and do-it-yourselfers.

Sheffield bolts are a vital part of railroads. They travel the highways in cars and trucks. They fasten machinery and rigs in the oilfields, and ride the air-lanes in jet aircraft. They go down to the sea in ships, and are on the job at home in appliances and power mowers.

Wherever the need is for steel bolts, Sheffield delivers the right bolt, right when it's needed. That takes a lot of skill and productive capacity. That's what you get from one of the world's largest bolt plants, where bolts are made and quality-controlled by Sheffield, from furnace to finished product.

You name the need. Sheffield has the bolt. Standard, special, or custom-made to specifications. Get in touch with your Sheffield Man.

SHEFFIELD
ARMCO

BOLT PRODUCTS

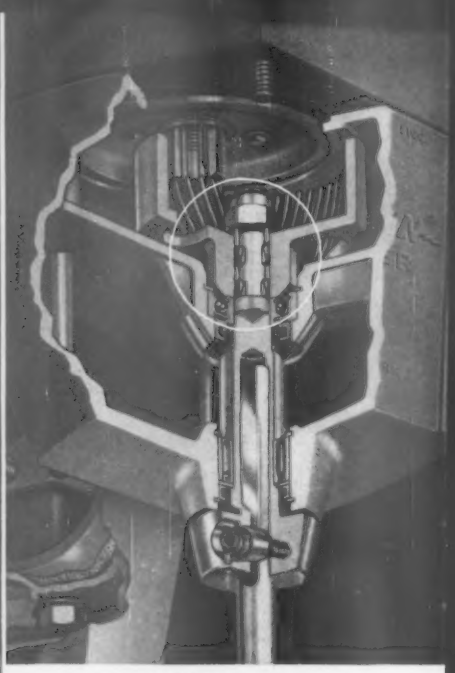
SHEFFIELD DIVISION

Sheffield Plants in Kansas City, Tulsa and Houston

ARMCO

ARMCO STEEL CORPORATION

OTHER DIVISIONS AND SUBSIDIARIES: Armco Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products



SHOCK OVERLOADS can't damage the mixer drive. In gear-drive models, GripSpring assembly between gear and drive shaft lets gear slip if overloaded more than 50%. It's a safety feature you never could get before in a portable mixer.

NEW MIXER

Get set to topple some traditions in fluid-mixing ease and economy

You won't have to lubricate it for five years.

Overloads can't hurt the gear drive.

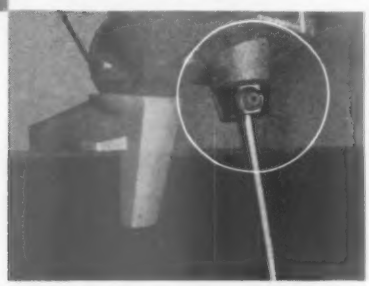
It comes with a chemical plant motor as *standard*, at no extra cost.

You don't need three hands to remove the shaft.

And it mixes fluids like no portable mixer you've ever seen. Delivers up to 45% more fluid flow in gear-drive models . . . higher impeller head in direct-drive models. Actually lets you handle many mixing jobs with a *smaller* mixer drawing *less power.*

That's just a sampling of the new LIGHTNIN Portable Mixer. It has been tested under every conceivable condition of use and load. It's ready—in sizes from ⅛ to 3 hp, gear drive or direct drive. And the price is right.

Your LIGHTNIN Mixer representative will be glad to show you why you can use it to mix fluids better—and at lower cost—than ever before. You'll find him listed in Thomas' Register and in the yellow pages of your telephone directory. Call him today. Or write us for descriptive Bulletin B-520.



SAVE COST of a corrosion-resistant alloy with this shaft chuck. It's way up out of the tank—always above liquid level. It's simple, quick-acting. Tighten one screw, and shaft is locked—can't come loose unless you want it to.

NO MYSTERY about the right mixer angle for best mixing. Vertical and horizontal indexing makes it a snap to describe the right setting so everybody understands.

IN FIXED MOUNTINGS, TOO. Get the same all-new advantages in permanent-mounting LIGHTNIN Mixers for open and closed tanks. A complete line, sizes from ¼ to 3 hp. For details on these, send for Bulletin B-521.

Lightnin® Mixers

MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 174-k Mt. Read Blvd., Rochester 3, N.Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Avenue, Toronto 19, Ont.

shutdown restart (indicator light), (13) shutdown lockout (indicator light), and (14) alarm (indicator light).

One dispatcher per shift can safely dispatch the system with a bare minimum of time and effort. If a fault develops in the communication and telemetering equipment linking the dispatcher with the controlled stations, the controlled stations will continue to operate in a safe manner with the last set of instructions from the dispatcher until the fault is corrected.

Computers

The dispatcher has at his disposal a number of important dispatching aids. Two of the more important ones are the computers — one to handle flow problems and the other to handle the centrifugal-compressor problems.

Each of these computers are tailored to the Transwestern pipeline system and for this reason a third computer, universal in nature, handles more general flow problems.

The computers are mounted in one console cabinet with the compressor analyzer on the extreme right of the cabinet, the pipeline simulator and the universal pipeline simulator occupying the other sections of the console. Adequate provisions have been incorporated in the computers for future expansion. The units were designed by Gulf Interstate and manufactured to specifications by Computers, Inc.

Compressor analyzer. This computer solves the equations which govern the behavior of centrifugal compressors in a station. By setting into the computer known external conditions, the dispatcher can immediately observe the operating conditions of each compressor.

The computer has four basic problems that can be automatically solved, reading out the desired information. The problems are:

1. Solve for equal hp.

GIVEN:
- A. Station suction pressure
- B. Station discharge pressure
- C. Gas-flow rate
- D. Suction temperature

SOLVE:
- A. Horsepower
- B. Revolutions per minute
- C. Brake mean effective pressure
- D. Compressor efficiency

2. Solve for equal r.p.m.

GIVEN:
- A. Station suction pressure
- B. Station discharge pressure
- C. Gas-flow rate
- D. Suction temperature

SOLVE:
- A. Revolutions per minute
- B. Brake mean effective pressure
- C. Horsepower
- D. Compressor efficiency

3. Solve for equal BMEP.

GIVEN:
- A. Station suction pressure
- B. Station discharge pressure
- C. Gas-flow rate
- D. Suction temperature

SOLVE:
- A. Brake mean effective pressure
- B. Horsepower
- C. Revolutions per minute
- D. Compressor efficiency

4. Solve for actual operating conditions.

GIVEN:
- A. Station suction pressure
- B. Station discharge pressure
- C. Gas-flow rate
- D. Suction temperature
- E. Engine-governor setting

SOLVE:
- A. Horsepower
- B. Revolutions per minute
- C. Brake mean effective pressure
- D. Compressor efficiency

It is possible to solve other problems of interest by having the analyzer in one of the various problem positions and varying an input value. The computed values of brake horsepower, brake mean effective pressure, revolutions for minute, discharge pressure and compressor efficiency are read from ammeters inscribed with the appropriate units.

Magnetic amplifiers and silicon diodes make up most of the components with no vacuum tubes being used. This results in a unit that is virtually maintenance-free and that has a comparatively low power consumption. The computer can operate accurately with broad voltage fluctuations.

Pipeline simulator. This computer simulates the physical characteristics of the pipeline electronically. It is divided into four sections: Main line, West Texas lateral, Panhandle lateral, and universal. All are mounted in one console cabinet.

Each section consists of a Panhandle equation computer, horsepower computer, memory mechanisms and means of switching the units into appropriate circuits for automatically computing the flow on the pipeline. The operator must program the computer for the type of problem to be solved and insert the known data into the machine.

"The pipeline computer is able to compute not only the flow and pressures required at the stations, but is also able to compute the horsepower required at the station to produce the desired flow."

Selectors are provided to choose which direct problems are to be put into the computer. Problems of these four kinds can be solved:

1. Normal operating conditions where discharge pressure is inserted for each station.

2. Normal operating conditions in which horsepower is inserted for each station.

3. Solution of conditions for which a known flow rate, terminal pressure, and suction pressure at Roswell station will produce the same horsepower required at every station on the main line.

4. Solution of conditions for which a known flow rate, terminal pressure, and suction pressure at Roswell station will produce maximum permissible discharge pressure at all stations.

The computer solves the problems in a set order and works from station to station. Limits for discharge pressure and compression ratio are automatically inserted into the machine. The horsepower limits are inserted by dials in the front panel. If a limit condition is exceeded, an alarm is given. The operator can then make the necessary adjustments to arrive at a workable solution.

Each Panhandle equation computer takes into account suction pressure, discharge pressure, flowing temperature, specific gravity, line efficiency, line length, elevation correction, flow rate, and pipe diameter.

The pipeline computer is able to compute not only the flow and pressures required at the stations, but is also able to compute the horsepower required at the station to produce the desired flow. There are separate horsepower computers integrated within the pipeline simulator.

The data computed by the Panhandle flow computers are fed into the horsepower computers, to compute the station horsepower. The station suction and discharge pressures, suction temperature, flow, and even a fuel factor is supplied to the horsepower computer, which then computes not only the station horsepower, but also the quantity of fuel gas that the computed horsepower will consume.

All data relative to the computed solution and the data supplied to the computers are read out on a digital voltmeter. The data can be automatically recorded by an electric typewriter in the computer console.

Corrosion headaches?

Maybe bimetallic pipe's the medicine

SELECTING construction materials for process piping is a tough job at best. Although it is nearly always possible to select a material which will stand up in corrosive service, frequently this choice is not the most economical.

For example, the cost of alloy piping is usually greater than the cost of replacing carbon-steel piping several times. Since nearly all processes are subject to obsolescence it is wasteful to use expensive alloys when the unit must be modified frequently.

One way to take advantage of the special properties of alloys and at the same time avoid excessive expense is to use only a thin alloy lining inside ordinary carbon-steel pipe.

Describing the properties of bimetallic pipe to the ASME petroleum mechanical engineering conference in New Orleans, September 19, Dan Christopher, of Gray Tool Co., Houston, pointed out that the use of strip lining shows its greatest advantages when pressures are high, sizes are large, or alloys are expensive.

As a corrosion-resisting product, Christopher noted five specific areas where bimetallic pipe could be used.

. . . If the corrosive atmosphere can be controlled by a thin layer of corrosion-resisting material, bimetallic pipe will frequently be less expensive than solid alloy pipe.

. . . If it is necessary to use alloys to protect the product, it may be much easier to use a suitable lining than to try to remove contaminant at some other point in the process.

. . . If there is a dual corrosive atmosphere for which no one material is suited, bimetallic pipe may provide an answer.

For example, heat exchangers which have salt water on one side and a corrosive agent on the other present such a problem.

. . . If a catalyst is poisoned by ordinary piping materials, bimetallic pipe might serve as a catalyst's support or as a vessel to speed reaction.

. . . If structural demands of a piping system are greater than can be withstood by the alloy material, then the high strength of steel-lined pipe may suffice.

What Metals to Use?

For lining materials there is a wide choice. The most popular are alloys of copper and nickel, ranging from pure copper to pure nickel. Next in order of demand are the austenitic stainless steels. Experimental work is now being carried out with titanium, tantalum, and zirconium, each holding considerable promise for future needs.

Christopher explained that the cost of lining material is by no means directly proportional to its thickness. In 2 to 6-in. pipe size, linings of 0.935 in. now represents the economical and practical minimum. If the finished product does not have to be welded, this lining may be reduced to 0.01 in.

This thickness will offer adequate protection against most corrosion conditions, as well as sufficient mechanical strength to withstand abuse in handling and fabrication. Linings as heavy as 0.078 in. have been applied to pipe up to 16-in. diameter, but possibly experience will permit this thickness to be reduced.

Pipe sizes up to 4-in. can usually be furnished with seamless linings; and in sizes 4-in. and larger, welding linings are required. If a very thin lining is required, regardless of the diameter, a welded material represents about the only thing currently available.

What About Heat Transfer?

It would be unreasonable to assume that two pieces of material squeezed together in any way would possess equivalent heat-transfer properties to that of solid metal, Christopher said. In general, if the heat-transfer characteristics of each, the base and linning material, are drawn on one chart, then the heat-transfer characteristics of the bimetallic pipe lie between these two curves.

One limitation to good heat transfer can be caused by the lack of effective contact between the base and the lining. Good contact is obtained only by good manufacturing technique. Even then, good contact can be made only if the surfaces are clean. Certainly, contaminants of any sort, including oxides, may possess poorer heat-transfer properties than the base and lining materials.

Probably the most important factor influencing the contact is the surface roughness of the tubes. If the mating surfaces have large irregularities, 100% contact is impossible.

On the other hand, if the surfaces are mirror bright and vary no more than 10 μin., the contact areas should be very good.

However, contact area will never be 100%. Therefore, heat transfer by conduction is a function of this amount of contact, plus the transfer by radiation across the areas which are not in contact.

Some investigators have suggested that this interface area should be bathed in a low-molecular-weight gas, such as helium, or possibly even a third metal, such as tin, which might be liquid under some temperature conditions. However, test data on this subject are limited.

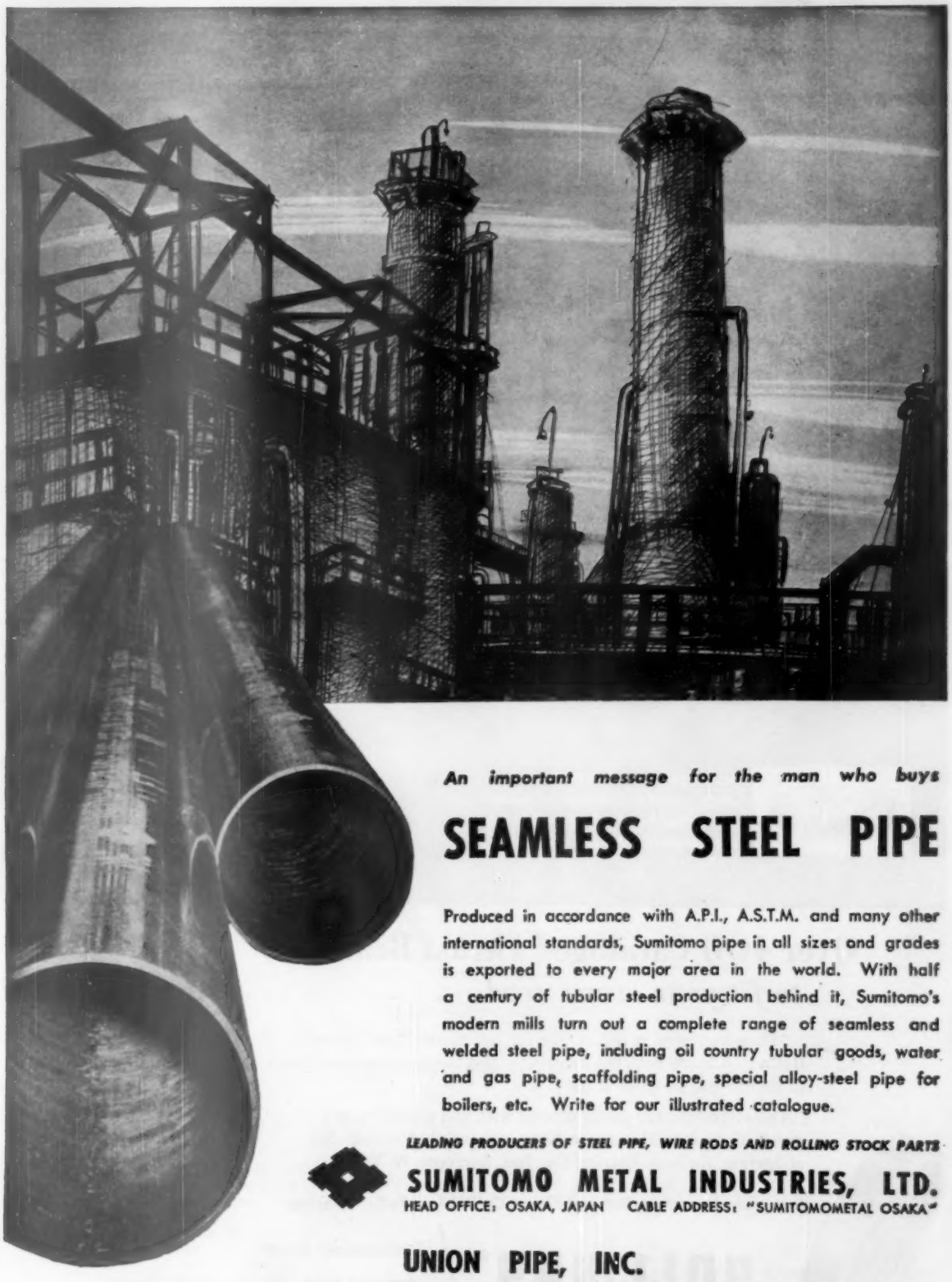
The matter takes on considerably less importance if it is realized that the film coefficient of heat transfer may be greater than the conductivity of the tubes. Fouling factors that exist in many heat exchangers further reduce this loss to the point of insignificance. In some installations the ability of bimetallic tubes to resist corrosion and fouling has actually improved the over-all heat transfer of equipment.

Christopher gave an example of one exchanger that has been in service over a year, comprising about 16,570 sq. ft. of steel and lined with cupro-nickel. It performs exactly as its counterpart having solid cupro-nickel tubes, he said.

Effect of Pressure

Christopher further pointed out that lining material adds considerably to the over-all strength of any base pipe. It will be stronger in the resistance to internal pressure and will also be stronger in the resistance to normal bending forces.

ASTM code, however, does not recognize this additional strength consideration, and any calculations regarding pressures should be based upon the characteristics of the base pipe (the material from which it is made, and the wall thickness).



An important message for the man who buys

SEAMLESS STEEL PIPE

Produced in accordance with A.P.I., A.S.T.M. and many other international standards, Sumitomo pipe in all sizes and grades is exported to every major area in the world. With half a century of tubular steel production behind it, Sumitomo's modern mills turn out a complete range of seamless and welded steel pipe, including oil country tubular goods, water and gas pipe, scaffolding pipe, special alloy-steel pipe for boilers, etc. Write for our illustrated catalogue.

LEADING PRODUCERS OF STEEL PIPE, WIRE RODS AND ROLLING STOCK PARTS

SUMITOMO METAL INDUSTRIES, LTD.

HEAD OFFICE: OSAKA, JAPAN CABLE ADDRESS: "SUMITOMOMETAL OSAKA"

UNION PIPE, INC.

AGENT OF OIL COUNTRY TUBULAR GOODS & LINE PIPE IN U.S.A.
420 LEXINGTON AVENUE, NEW YORK 17, N.Y.

Bearing at left has 1.75″ bore, while tandem bearing in main illustration has 17.0″ bore. *Yet both are standard, cataloged items.*

Over 400 Cataloged Thrust Bearings

to fit your every need . . .

When you need a thrust bearing, no matter how special, Rollway is ready with the know-how and the precision machinery to design and produce it for you.

Our engineers will gladly consult with you regarding any standard or special-purpose types you need. No cost. No obligation. Rollway Bearing Co., Inc., Syracuse. N. Y.

Complete line of Radial and Thrust Cylindrical Roller Bearings

Select from 7
ROLLWAY
Standard Types

designed, tested and ready for production with load capacities to 4,800,000 pounds.

Ask for Catalog PT-659.

ROLLWAY®
BEARINGS

ENGINEERING OFFICES:

Syracuse • Boston • Chicago • Detroit • Toronto
Pittsburgh • Cleveland • Seattle • Houston
Philadelphia • Los Angeles • San Francisco

OIL-WELL PUMPING
PART 19

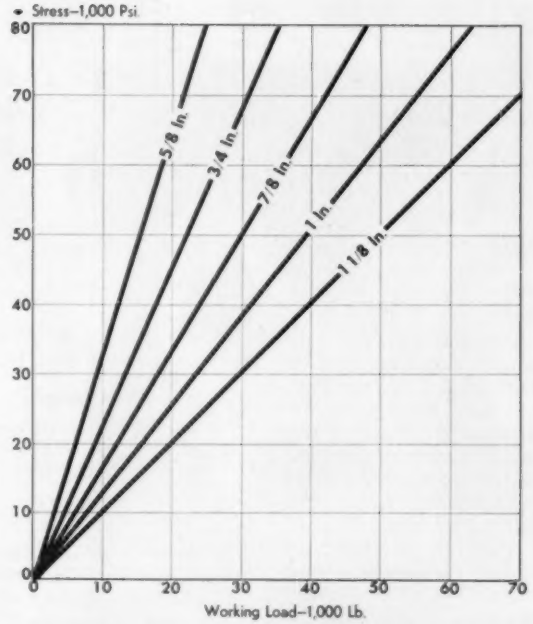
Sucker-rod constants

IN CALCULATIONS leading toward design of sucker-rod strings certain dimensional and other sucker-rod constants have to be used. Those most frequently needed are shown in Table 5. The dimensional constants are from API Standard 11-B, "API Specification for Sucker Rods," thirteenth edition, January 1960. The weight per 100 ft. is an approximate average of the commercially available rods. Other constants have been calculated.

From the constants in Table 5 other data can be found. For instance, the weight of rods in fluid can be calculated from displacement data by dividing the figure on displacement for given length of rods by 231 (number of cubic inches in a gallon) multiplying by weight per gallon of the fluid and subtracting from the actual air-weight of the length of rods. Table 6 gives weight per gallon at 60° F. of oils of different gravities. Weight per gallon of water at 62° F. is 8.3356 lb. The weight per gallon of different oil field brines varies. A figure of 9 lb. per gallon is sometimes used.

The chart in Fig. 25 may be used to convert well loads to corresponding stresses for different-sized rods. Or, it may be applied for determination of the well load which can be handled by a rod of a given size having a given safe working stress.

Table 7 gives weight of fluid on plunger for different plunger sizes and fluids of different gradients, the information needed in certain methods of design of the rod strings[1].



ROD STRESSES may be obtained from working load by using this correlation for three sizes of rods. Fig. 25.

BY JOE ZABA

Selection of rods. Design of a rod string resolves itself into selection of rods which, with the lowest weight and cost of the string, are stressed within allowable limits by the well load. This insures a good probability of low operating cost. In selecting the allowable rod stress the degree of corrosiveness of the well fluid and the range of stresses have to be considered.

For noncorrosive conditions, or for 100% corrosion inhibition there

TABLE 6—WEIGHT PER GALLON AT 60° F. OF OILS OF DIFFERENT API° OF GRAVITY

API°	Lb. per gal. at 60° F.
10	8.328
15	8.044
20	7.778
25	7.529
30	7.296
35	7.076
40	6.870
45	6.675
50	6.491
55	6.316

TABLE 5—SUCKER-ROD CONSTANTS

Size of rod—	⅝-in.	¾-in.	⅞-in.	1-in.	1⅛-in.
Dimensions of couplings for "double pin" rod, in.	1½ by 4 *1¼ by 4	1⅝ by 4	1 11/16 by 4 †1⅝ by 4	‡2 7/16 by 4 §2 by 4	¶2⅜
Nominal outside diameter of pin, in.	11/16	1 1/16	1 1/16	1⅜	1 1/16
Outside diameter of box in "pin and box" rod, in.	1⅜	1½	1⅝	2	2¼
Cross-sectional area of rod, sq. in.	0.30566	0.44156	0.60132	0.78500	0.99351
Weight per 100 ft., lb.	116	163	216	288	364
Displacement,‖ per 100 ft., cu. in.:					
For 25-ft. rods	384	556	752	987	1,257
For 30-ft. rods	380	550	744	977	1,241
Stretch, inches per 100 ft. per 1 lb.	0.000130	0.000091	0.000066	0.000051	0.000040

*For use in 1.900-in. o.d. tubing. †For use in 2⅜-in. o.d. 4.70-lb. external-upset tubing. ‡For use in 3½-in. o.d. or larger tubing. §For use in 2⅞-in. o.d. tubing. ¶For use in 3½-in. o.d. or larger tubing. ‖Approximate.

TABLE 7—CONVERSION OF FLUID GRADIENT TO WEIGHT OF FLUID FOR VARIOUS SIZE PLUNGERS

Gradient psi./ft.	Plunger size (in.) 1	1¼	1½	1¾	2	2¼	2½	2¾	3	3½	4	4½	5
	(Weight of fluid in lb. per ft.)												
0.30	0.235	0.368	0.530	0.722	0.942	1.19	1.47	1.78	2.12	2.89	3.77	4.77	5.89
0.31	0.243	0.380	0.548	0.746	0.974	1.23	1.52	1.84	2.19	2.98	3.90	4.93	6.09
0.32	0.251	0.393	0.565	0.770	1.01	1.27	1.57	1.90	2.26	3.08	4.02	5.09	6.28
0.33	0.259	0.405	0.583	0.794	1.04	1.31	1.62	1.96	2.33	3.17	4.15	5.25	6.48
0.34	0.267	0.417	0.601	0.818	1.07	1.35	1.67	2.02	2.40	3.27	4.27	5.41	6.68
0.35	0.275	0.429	0.618	0.842	1.10	1.39	1.72	2.08	2.47	3.37	4.40	5.57	6.87
0.36	0.282	0.442	0.636	0.866	1.13	1.43	1.77	2.14	2.54	3.46	4.52	5.72	7.07
0.37	0.291	0.454	0.654	0.890	1.16	1.47	1.82	2.20	2.61	3.56	4.65	5.88	7.26
0.38	0.298	0.466	0.671	0.914	1.19	1.51	1.86	2.26	2.69	3.66	4.76	6.04	7.46
0.39	0.306	0.478	0.689	0.938	1.22	1.55	4.91	2.32	2.77	3.75	4.90	6.20	7.66
0.40	0.314	0.491	0.707	0.962	1.26	1.59	1.96	2.38	2.83	3.85	5.03	6.36	7.85
0.41	0.322	0.503	0.724	0.986	1.29	1.63	2.01	2.43	2.90	3.94	5.15	6.52	8.05
0.42	0.330	0.515	0.742	1.010	1.32	1.67	2.06	2.49	2.97	4.04	5.28	6.68	8.25
0.43	0.338	0.528	0.760	1.03	1.35	1.71	2.11	2.55	3.04	4.14	5.40	6.84	8.44
0.44	0.346	0.540	0.777	1.06	1.38	1.75	2.16	2.61	3.11	4.23	5.53	7.00	8.64
0.45	0.353	0.552	0.795	1.08	1.41	1.79	2.21	2.67	3.18	4.33	5.65	7.16	8.83
0.46	0.361	0.564	0.813	1.11	1.45	1.83	2.26	2.73	3.25	4.43	5.78	7.32	9.03
0.47	0.369	0.577	0.830	1.13	1.48	1.87	2.31	2.79	3.32	4.52	5.91	7.48	9.23
0.48	0.377	0.589	0.848	1.15	1.51	1.91	2.36	2.85	3.39	4.62	6.03	7.63	9.42
0.49	0.385	0.601	0.866	1.18	1.54	1.95	2.40	2.91	3.46	4.71	6.16	7.79	9.62
0.50	0.393	0.614	0.883	1.20	1.57	1.99	2.45	2.97	3.53	4.81	6.28	7.95	9.82

should be a general agreement regarding the allowable maximum working stresses of rods made from the same type of steel. This, however, is not the case. Because of processing differences, there is a lack of complete agreement in recommendations of manufacturers for limits of maximum stresses of rods of the same group of steels. Also, there are differences of opinion regarding the subject among the users. Since there are so many types and makes of rods, only the most general statements can be made regarding this matter. Rods of the carbon manganese steels group are being stressed up to 30,000 psi. Rods of the nickel molybdenum steels group are stressed up to 33,000 psi. Allowed stresses of up to 45,000 psi. are used for the so-called high-tensile rods.

There are even more pronounced differences of opinion about maximum working stresses of rods if corrosion is known to exist and it not inhibited. As discussed in Part 13, no reliable laboratory test data are available pointing out the extent to which the maximum stresses should be reduced because of existence of corrosion. For salt-water conditions some operators reduce the stresses to 65% of maximum for noncorrosive conditions for the carbon manganese steel rods and to 85% of maximum for alloy steel rods. For hydrogen sulfide conditions the carbon manganese rods are generally not recommended and the stresses of alloy steel rods are reduced to 65% of the maximum. In most cases local experience with rod failures is relied upon. In view of the success of the inhibitors there is a definite trend toward handling of corrosion by inhibition.

The importance of checking the range of stresses and one of the methods of doing this has been already discussed in Part 14.

Bibliography

1. J. Zaba and W. T. Doherty: "Practical Petroleum Engineers' Handbook," Gulf Publishing Co., fourth edition, 1956, p. 511.

ERRATA

In the seventh installment of this series (OGJ, July 25, 1960), our parentheses got mixed up with our /'s, and the formulas on pp. 215 and 216 came out all wrong. There are four formulas all together, and they should read as follows, in this order:

On p. 215, formulas should read:

$$P = (W_r + W_f)\ (1 + S \times SPM/5{,}400)$$

and

$$P = W_f + W_r\ (1 + SN^2/70{,}500)$$

On p. 216, formulas should read:

$$M = W_r\ (1 - SN^2/70{,}500) - CW_r$$

and

$$M = W_r\ (0.873 - SN^2/70{,}500)$$

Next week:

Refinery Maintenance Comes of Age

THE SMART REFINER is watching and controlling his maintenance cost and efficiency as never before.

To help the large and small refinery in this improvement program, the Journal is preparing a Special Report on Maintenance for the October 24 issue, featuring such timely topics as:

Organization methods in both large and small plants.

Training of supervisors, craftsmen, and apprentices, including correspondence courses, trade schools, and college-level courses.

Techniques for both onstream and offstream maintenance.

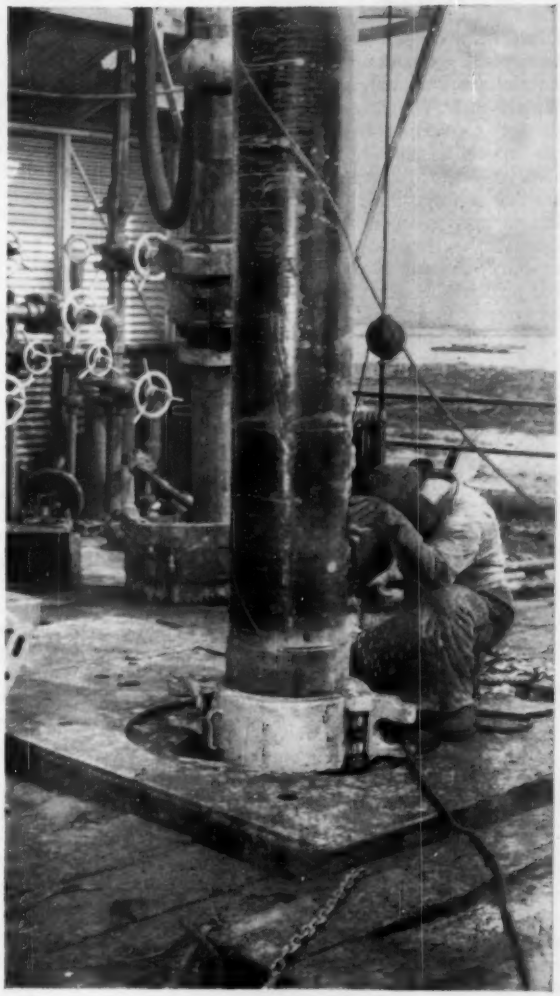
Manpower reduction and how this is being offset by more tools and better equipment.

Construction of larger and better units to reduce per-barrel costs.

Watch for this important report in next week's Journal.

WHY ARMCO CASING
cuts costs of field welds

Because the downhand fillet weld—the fastest and easiest weld to make—can be used on Armco Casing, high quality field welds are made in record time. The welded joint can be lowered into mud and water without danger of weld hardening. Just stab one end of a joint into the Armco Slip-Joint Collar, make a fast weld, and lower away immediately. Elapsed time stays down, cost stays down.



Other Advantages

Armco Casing is shipped in 40- or 50-foot lengths. This results in fewer joints, less running time, lower costs. The uniform lengths also mean you can quickly determine the footage in the hole or in the stockpile at any time.

You can also set lighter, lower cost strings to greater depths with Armco Casing because of its higher resistance to collapse. Tests show the variation in collapse-resistance of Armco Casing is less than for ordinary tubes.

Armco Casing, distributed by National Tank Company, ranges in size from 6 to 24 inches. For complete information, write to: Armco Drainage & Metal Products, Inc., 6250 Curtis Street, Middletown, Ohio, or 201 KOME Building, Tulsa, Oklahoma.

New steels are born at Armco

ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company • The Armco International Corporation • Union Wire Rope Corporation

Processes

Equipment

Economics

Sulfur recovery from petroleum gases eliminates an air-pollution problem and puts a profit in the till

HYDROGEN SULFIDE GAS, obtained as a byproduct from the desulfurization of gaseous or liquid hydrocarbons, provides an important raw material for the manufacture of elemental sulfur. There are several methods for converting hydrogen sulfide into elemental sulfur, but most of them have the disadvantage of being sensitive to impurities, such as carbon dioxide and hydrocarbons, that may be present in the acid gas stream. The one-third, two-thirds process, if operated properly, is almost impervious to any stream impurities.

Equipment that has been designed and fabricated according to the general rules outlined here plays a big part in making a plant of this type economically attractive.

BY ROBERT A. GRAFF

Graff Engineering Corp., Dallas, Tex.

Gas-processing plants. Hydrogen sulfide (H_2S) occurs as an impurity in many natural-gas streams, particularly those produced from deep limestone formations. This H_2S is nearly always accompanied by carbon dioxide (CO_2) in varying proportions, and both of these impurities must be separated from the natural-gas stream prior to further processing and pipeline delivery. The separation is usually accomplished by means of a regenerative contacting process using monoethanolamine (MEA). The byproduct gas stream recovered by this process may contain, in addition to the H_2S and CO_2, saturated light hydrocarbons. In a case where MEA is combined with glycol, for the simultaneous removal of acid gases and water vapor, the regenerated gases may also contain traces of glycol, as well as vapors of higher-molecular-weight hydrocarbons.

In oil-refinery operation, organic sulfur in the crude oil is converted to H_2S during the catalytic cracking or hydrogen-treating steps. The H_2S is then recovered from the product streams by means of any of the several extraction processes available. The recovered H_2S often contains an appreciable quantity of CO_2 as well as small amounts of saturated and unsaturated hydrocarbons.

Presented at the annual conference of the Petroleum Division of ASME, September 19-21, 1960, at New Orleans.

Conversion of H_2S to elemental sulfur is usually carried out by partial-oxidation methods, similar to the manufacture of carbon black by partial oxidation of natural gas. The general reaction is:

$$(H_2S)_g + (\tfrac{1}{2}\ O_2)_g \xrightarrow[1\ \text{atm.}]{60^\circ\ \text{F.}} 1/6\ (S_6)_g + (H_2O)_g + 232\ \text{B.t.u./s.c.f.}\ H_2S \quad \text{(in boiler and catalyst).} \qquad (1)$$

A simplified flow diagram is shown in Fig. 1 for a commercial sulfur-recovery unit operating under conditions illustrated by Equation 1.

Referring to Fig. 1, the acid-gas stream is mixed with the theoretical amount of air and burned in external combustion chamber "A." Products of partial combustion pass to heat-recovery boiler "B," where high-pressure steam is produced by partial cooling of the combustion gases, and a portion of the sulfur is condensed Effluent gas from "B" passes to catalytic converter "C," where the reaction continues at a lower temperature level. Reacted gases leave "C" and pass to the sulfur condenser "D," at which point low-pressure steam is generated (15-55 psi.), and additional sulfur is condensed. Effluent gases from "D" then pass through mist eliminator "E" and out a vent stack.

This type of sulfur-recovery operation is known as a free flame, or total-acid-gas-stream-combustion method.

While this total-combustion method presents a relatively simple method for the conversion of H_2S to elemental sulfur, it has disadvantages when applied to acid-gas streams that also contain CO_2, hydrocarbons, or other impurities.

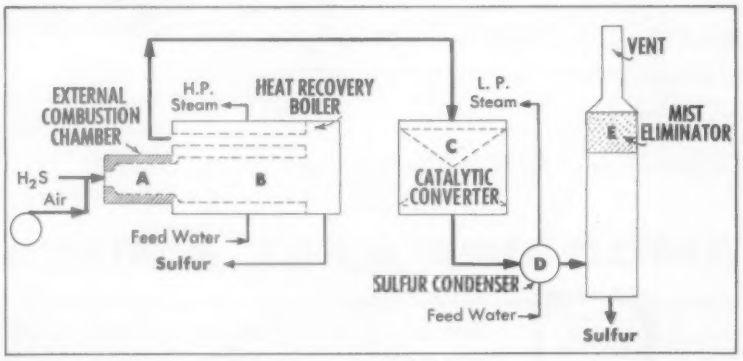
When Reaction 1 is carried out in the presence of CO_2, the following reaction also occurs:

$$(H_2S)_g + (CO_2)_g \xrightarrow[1\ \text{atm.}]{60^\circ\ \text{F.}} (COS)_g + (H_2O)_g - 39\ \text{B.t.u./s.c.f.}\ H_2S. \qquad (2)$$

Reaction 2, favored by higher temperatures, is undesirable, so additional conversion steps must be carried out at a lower temperature to reverse this reaction and reconvert the carbon oxysulfide (COS) back to H_2S, for final conversion to elemental sulfur.

The presence of hydrocarbons or glycol in the acid-gas stream can result in the formation of free carbon in the products of partial combustion thus causing carbon fouling of the catalyst with attendant conversion loss.

Refractory maintenance presents a problem in connection with the total-combustion method, since the external



TOTAL COMBUSTION PROCESS of converting H_2S to elemental sulfur is sensitive to the presence of CO_2 in the feed. Fig. 1.

combustion chamber usually operates at temperatures in the range of 3,000° F. or more. Carborundum fire brick has been used for this service with a high degree of success; however, metal burnouts frequently occur at the outer furnace shell.

A modification of the total-combustion process has recently been placed in commercial operation (1), in which only low-pressure steam is generated, and isolated passes of a fire-tube steam generator are used for the sulfur-condensing services. This system uses two stages of catalytic conversion, with sulfur condensation and reheating between stages. The second-stage gas is reheated by mixing with a portion of the hot gas from the combustion chamber.

The conversion of H_2S to elemental sulfur can also be represented as a two-step process, by Equations 3 and 4 as:

$$(H_2S)_g + 3/2\,(O_2)_g \xrightarrow[1\text{ atm.}]{60^\circ} (SO_2)_g + (H_2O)_g + 588$$

B.t.u./s.c.f. H_2S

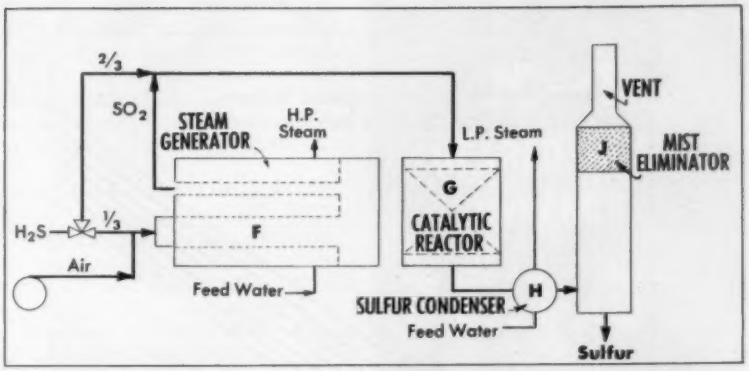
(in steam generator). (3)

$$2\,(H_2S)_g + (SO_2)_g \xrightarrow[1\text{ atm.}]{60^\circ} \tfrac{1}{2}\,(S_6)_g + 2\,(H_2O)_g + 53.5$$

B.t.u./s.c.f. H_2S (in catalyst). (4)

Sulfur-recovery unit operated under the conditions represented by Equations 3 and 4 is relatively insensitive to impurities in the acid-gas stream. In the first step of the process, combustion occurs under slight oxidizing conditions to insure complete combustion of hydrocarbons and eliminate the formation of COS. Special refractory materials are not required because a water-cooled furnace can be used. A simplified flow diagram for a commercial unit operating on such a system is illustrated by Fig. 2.

Hydrogen sulfide feed to the unit as seen in Fig. 2 is divided into a one-third stream and a two-thirds stream. The one-third stream is burned in the furnace of steam generator "F" to produce sulfur dioxide (SO_2). This SO_2 is then recombined with the two-thirds stream, and flows to catalytic reactor "G," where the final reaction covered by Equation 4 occurs. Reaction products enter sulful condenser "H," where sulfur is condensed. The residue gas then passes through mist eliminator "J," where final traces of



ONE-THIRD to two-thirds process is relatively insensitive to feed-stream impurities and is easily controlled. Fig. 2.

entrained sulfur are removed prior to venting to the atmosphere.

The two-step process, commonly referred to as the one-third to two-thirds process, permits a high degree of control over the reactions involved, since the major portion of the heat is liberated in the boiler firebox.

Catalyst activity is maintained at a high level because the entering gas does not contain entrained sulfur, as may be the case with the total-combustion method.

For maximum catalytic activity, gas entering the catalytic converter should be 25° to 50° F. above the dew point of the sulfur in the converted gas. An additional advantage of the one-third to two-thirds system, is the fact that sulfur is not produced in the steam generator firebox, but at the sulfur condenser only.

Design Considerations

The fired steam generator may be of the water-tube or fire-tube type. The gas side of the steam generator should be designed for pressurized operation, and in such a manner as to prevent migration of vapors to cold portions of the fire-box casing, to avoid condensation and corrosion. Provision should be made for external or internal bypassing of hot furnace gases to allow regulation of boiler flue-gas temperature when operating at less than maximum design rates. Carbon-steel construction is satisfactory for contact with the products of combustion gas; however, this material should be protected by refractory or insulating materials, when not subject to water or steam cooling. A temperature limitation of approximately 700°-750° F. is usually applied to bare unprotected carbon steel for this service.

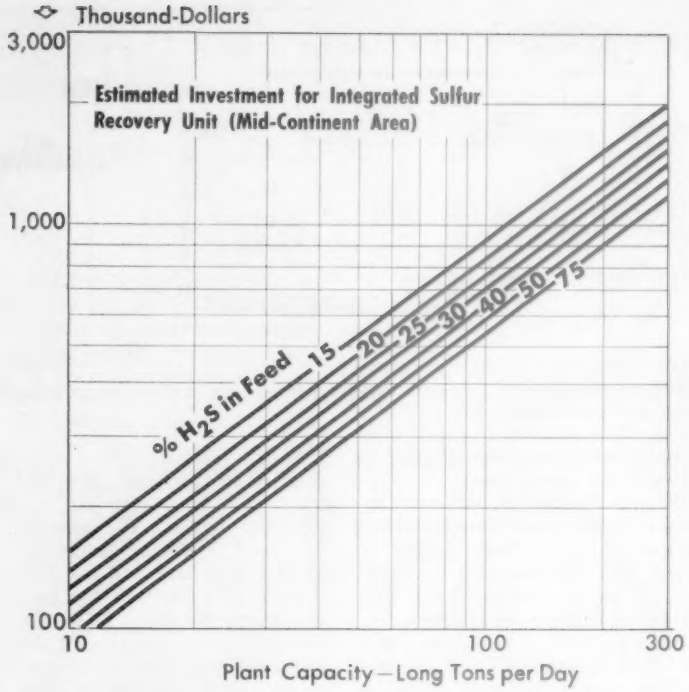
The catalytic reactor is usually a refractory-lined, carbon-steel vessel, with suitable openings for placement and removal of the sulfur-conversion catalyst. Load-bearing catalyst supports are fabricated from alloy-steel materials or cast from alloy iron and the catalyst itself rests on an alloy wire-cloth screen. The geometry of the vessel is usually determined by the H_2S flow rate, and the allowable pressure drop through the catalyst[2]. The volume of catalyst required varies with the type of operation. Baehr and Mengdehl[3] state that for the one-third to two-thirds reaction, a ratio, by volume of catalyst to H_2S to be converted, may be 1:2 or more. This value would also apply to the total-combustion method, with the necessary adjustments made for the sulfur that is noncatalytically formed in the steam-generator firebox.

The catalyst almost universally used for sulfur conversion is a natural bauxite that has been activated by heating to 700°-750° F. and calcined to a residual water content of 6%. Activity of the catalyst is seriously impaired by overheating or carbon deposition.

Overheating can occur if excess air is introduced into the system during periods when a process upset might occur. Carbon deposition on the catalyst in the total-combustion process was discussed previously.

In the one-third to two-thirds process, certain types of hydrocarbons that may be present in the two-thirds acid-gas stream can dehydrogenate upon contact with the sulfur-conversion catalyst, with the result that carbon is deposited on the active surface of the catalyst. Unsaturated, low-molecular-weight hydrocarbons in the C_4 range, as well as saturated hydrocarbon vapors in the gasoline and kerosine range, will cause this difficulty and must be removed prior to conversion to elemental sulfur.

Sulfur condenser. The condensation of liquid sulfur from the reacted gases leaving the catalytic reactors presents some interesting problems. As is common with other cases where a liquid



SULFUR RECOVERY PLANT economics vary widely depending on such variables as H_2S concentration in the feed stream, plant size, plant location, and market location. Fig. 3.

is condensed in the presence of a large volume of inert gas, the formation of sulfur as a fog or finely dispersed aerosol phase in the inert-gas stream often occurs. This condition has been found to be a result of gas to-gas contact cooling, rather than metal-to-gas contact cooling. When a process-gas stream, at its sulfur dew point, is cooled by contact with a heat-transfer surface, a portion of the sulfur condenses and deposits on the tube wall. The subcooled gas leaving the tube wall then contacts the saturated gas in the center of the tube, cooling it enough to deposit liquid sulfur in the form of a fog in the gas stream.

For this reason the rate of heat transfer in the sulfur condenser should be controlled to avoid rapid chilling of the gas stream.

The present trend for the design of these units is to utilize low-pressure steam generators. They are usually of the vertical shell-and-tube type, with the gas on the tube side. Temperature control can be obtained by varying the water level. In the absence of excessive temperatures, carbon-steel construction is satisfactory for the construction of this type of sulfur condenser-steam generator.

Disposal of vent gas. Single-stage sulfur-recovery units, i.e. units with one catalytic reactor, will recover up to 95% of theoretical value. On this basis, the vent gases from the sulfur-recovery unit may contain 1 to 3 mole % of unconverted H_2S and SO_2.

Release of H_2S to the atmosphere is not permitted in populated areas, and incineration of the waste-gas stream is recommended prior to venting. This incineration can be carried out by preheating the waste-gas stream to 900°-1,000° F., by means of a direct air-heater gas burner. Sufficient excess air can be introduced at the burner to provide oxygen necessary for complete combustion. The noncatalytic oxidation of H_2S to SO_2 occurs at a rapid rate, and 100% conversion can be obtained.

Investment required for a sulfur-recovery plant varies both with the size of the unit and the H_2S concentration in the feed-gas stream. Based on average Mid-Continent U.S.A. construction costs, Fig. 3 illustrates the approximate installed cost for an integrated sulfur-recovery unit, operted in conjunction with existing facilities.

Process Considerations

Acid-gas feed preparation. The overhead acid gas from an amine-solution regeneration system is the most common feed to a sulfur-recovery unit. This stream is usually at 5-10 psig. and 90°-130° F. and saturated with water vapor. The presence of small quantities of C_1, C_2, and C_3 hydrocarbons does not materially affect the operation of a sulfur-recovery unit, other than increase the heat load. Unsaturated hydrocarbons and high-molecular-weight hydrocarbon vapors, as impurities in acid-gas streams will result in carbon fouling of the catalyst. Also, traces of these impurities will produce a sulfur product that varies from a dark-brown chocolate color, to a dull greenish-gray light color.

To minimize the presence of hydrocarbon in the acid gas-stream, enriched amine solution from the base of the amine-gas contactor should be flashed at a lower pressure, and the flashed hydrocarbons refluxed with additional amine solution to separate H_2S from the flashed hydrocarbon gases. Certain unsaturated hydrocarbons are appreciably soluble in amine solution, and by preheating the solution to approximately 150° F. by heat exchange, prior to phase separation at the flash drum, a high degree of hydrocarbon separation can be obtained.

Acid-gas streams from amine-glycol systems often contain hydrocarbon vapors in the kerosine range that can be removed by adsorption methods. Activated carbon has been successfully used for the adsorbent, and regeneration can be obtained by the use of deaerated superheated steam.

Process control. The correct ratio of air and acid-gas streams may be obtained by the use of ratio flow controllers, using conventional orifice-measurement devices. When operating at maximum efficiency, vented gases from a sulfur-recovery unit will not contain free oxygen, and the ratio of unconverted H_2S to unconverted SO_2 will be approximately 2:1.

Due to the self-reactive nature of the gases being handled, conventional methods for gas analysis, i.e., Orsat or Tutweiler, are not too satisfactory. A continuous chromatographic analysis of the vent gas stream, at temperatures above the water and sulfur dew point of the vent gas, seems to offer the best approach to this problem[4]. It is recommended that a recording chromatograph be used as a guide for manual resetting of the air-H_2S ratio.

Handling product. The preferred method of handling product sulfur is in the liquid state. Tank-car or tank-truck shipment of molten sulfur involves minimum labor requirements and is the most common method used at this time. Inasmuch as sulfur-recovery units are seldom located at rail shipping points, molten sulfur is usually transported to a rail terminal by tank truck.

Solid sulfur is produced at locations where extensive liquid storage is im-

practical, due to seasonal variations in shipping schedules, or market conditions. Molten sulfur is usually solidified by exposure to the atmosphere in a sheet-metal, formed block. Two, ¾-in.-thick layers can be solidified per 8-hour shift. It is desirable to produce the sulfur storage block in ¾-in. laminations, since this type of block is readily broken up for loading by commercial mechanical front-end loaders. Where a sized, solid sulfur particle is required, the production of flake sulfur is recommended. An internal water-cooled, rotary-drum flaker is suitable for producing a flake product, and approximately 40 sq. ft. of cooled outside drum surface is required to flake 1 long-ton of sulfur per hour.

Other methods of producing flake sulfur involve the use of a water-cooled endless-metal-belt conveyer[5] or the use of a similar rotary device with multiple metal shelves[6].

Process economics. A plant for the recovery of elemental sulfur from H_2S requires less investment than for the equivalent plant capacity in the form of equipment and facilities for the Frasch sulfur-mining process. Offsetting this advantage is the fact that sulfur-recovery plants operating on byproduct H_2S streams are usually located in remote areas, far from the sulfur markets, while Frasch pocess mines are located in coastal areas, where transportation is not a serious problem.

The total cost (including depreciation and other fixed charges) for the manufacture of sulfur from byproduct H_2S varies with the size of the installation, and for larger units is in the range of 50% of the current price.

Presently, the market value for elemental sulfur is approximately $23.50 per long ton, f.o.b. Gulf Coast ports.

Individual plant economics will vary widely depending on such variables as H_2S concentration in feed stream, source of feed stream, need for low-pressure steam, labor contracts, tax structures, freight rates, company policies, plant location, size of plant, and market location.

In most instances the direct operating cost will be approximately $5.00 per long ton. Supervision, administration, amortization, and catalyst maintenance will cost from $5.00 to $7.00 per long ton. Taxes will depend on the company's financial situation as well as on state severance tax. The Texas state severance tax is currently $1.40 per long ton but a bill has been introduced which would lower the tax to $1.04 per long ton.

Market location will play an important part in the plant net-income picture because freight can be quite expensive. One purchaser pays $0.67 per long ton for freight by barge from the coast to his plant area lolacted 200 or 300 miles inland and then pays $1.10 per long ton to move the sulfur from the dock to his plant, 10 to 12 miles distant.

Bibliography

1. "A Cheap Way to Remove S from H_2S," G. M. Franklin, L. V. Kunkel, and M. Webb: The Oil and Gas Journal, Nov. 4, 1957, pp. 144-148.
2. "Sulfur Recovery in Canada," Anon.: The Oil and Gas Journal, Oct. 25, 1951, pp. 102-107.
3. U. S. Patent No. 2092386, Hans Baehr and Karl Braus, issued May 14, 1940.
4. Fourteenth annual instrument-automation conference, preprint No. 143-59, Sept. 21-25, 1959, R. L. Whitson and M. M. Fourroux.
5. "Cooling and Solidifying Molten Sulfur," H. E. Means, R. J. Callahan: Chemical Processing, November 1954.
6. Personal Communication from W. C. Grove, Blaw-Knox Co., Buffalo, July 23, 1954.

New Journal policy on tear sheets, reprints

For many years the Journal has been happy to supply readers with complimentary tear sheets and reprints of articles. Rising costs of handling and postage now force us to make a small service charge for these items.

Beginning October 1, 1960, if the article is available, a charge of 10 cents per page will be made for all tear sheets ordered (minimum charge 25 cents). Reprints of Journal articles, when available, will be charged for at the rate of 50 cents per copy. Payment or company purchase order must be sent with order.

Handbooks, maps, and charts will continue to be available and will be charged for at the prices listed on the current Reader Service publications listing.

Quantity orders for reprints (minimum order 100 copies) will be charged for on the same basis as in the past. Prices quoted on request.

Your inquiry or order should be directed to:

Reader Service Department
The Oil and Gas Journal
P. O. Box 1260

X-4
GEARED HEAD WRENCH

Not a ratchet . . . but a heavy-duty geared tool!

It will pay you to visit Booth X-15!

Here, you will be amazed to learn how an X-4 Geared Head Wrench can perform hundreds of vital maintenance miracles! And at less cost than conventional tools. Thousands of satisfied customers in many diversified industries specify the X-4 Geared Head Wrench to help solve maintenance problems.

You, too, will benefit with the X-4, "geared" for four major oil services, Drilling—Pumping—Transmission and Refining . . . . your "pipeline" to greater profit! Learn the facts! No obligation.

PERMIAN BASIN OIL SHOW
October 20-23, 1960

For complete information see your local distributor or write to:

THE
X-4 CORPORATION
Dept. OJ
WEST ACTON, MASS.

HIGH-PRESSURE JETS BLAST DEPOSIT-PACKED BUNDLES CLEAN AS NEW

The high-pressure jet unit below is blasting solidly-caked deposits from a heat exchange bundle . . . removing substantially all traces of deposits throughout the bundle, without cutting it apart!

Nation-wide Dow Industrial Service developed this automatic unit to remove scale, coke and asphalt deposits without metal erosion or wall thinning. This is just one of many advanced tools and techniques developed by Dow Industrial Service to clean equipment of every kind... boilers, pipelines, chemical process equipment, towers, scrubbers.

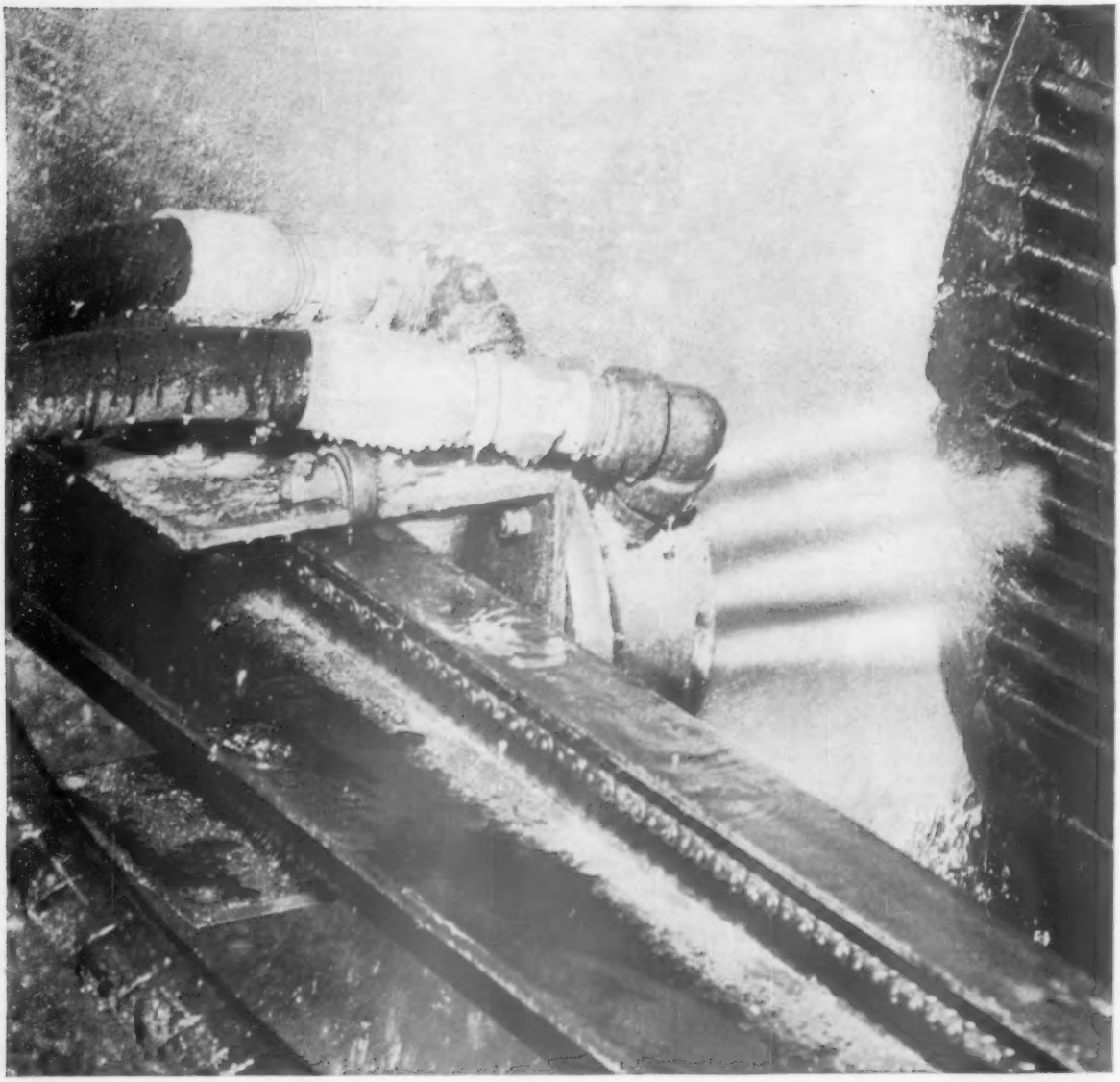
D. I. S. engineers first analyze your problem, then pick the most effective cleaning method . . . whether chemicals, steam, jet, foam, or other means. D. I. S. tailors the technique to give you most value per dollar.

In addition, D. I. S. offers complete consulting laboratory service for water treatment and waste processing problems, backed by the technical resources of The Dow Chemical Company.

D. I. S. is a nation-wide industrial service . . . and offers "total" cleaning. For cleaning equipment of *any* kind, *anywhere*, call D. I. S. We'll be glad to show you how to set up a year 'round cleaning program to *keep* equipment operating at top efficiency. Write or call DOW INDUSTRIAL SERVICE, 20575 Center Ridge Road, Cleveland 16, Ohio.

DOW

DOW INDUSTRIAL SERVICE · Division of The Dow Chemical Company

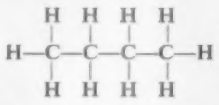


Automatic jet unit removes bundle deposits, without dismantling.

The
FOREMAN'S PAGE

Chemical properties of hydrocarbons

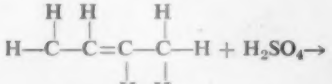
THE DIFFERENT families of hydrocarbons have different chemical properties. The paraffins, butane for example,



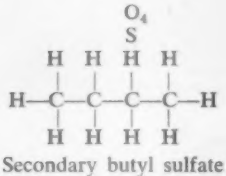
are generally inert chemically and do not enter into chemical reactions easily. They have no double bonds and are sometimes called saturates or saturated hydrocarbons, since they already have the maximum amount of hydrogen.

Olefins on the other hand are quite reactive. They are called unsaturates or unsaturated hydrocarbons because they are short of hydrogen and have double bonds. We take advantage of this reactivity of olefins in many ways in the refinery.

For example, at alcohol units we feed a mixture of butane and butylene into an absorber tower containing sulfuric acid. Nothing happens to the butane; it just bubbles through the tower unchanged. The butylene is dissolved by the acid, though, because of the double bond. When water and steam are added, butylene and water combine chemically to form alcohol. The chemist would show the reactions:

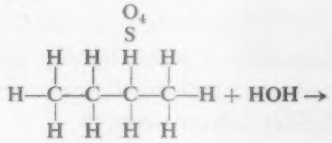


Butylene — Sulfuric acid

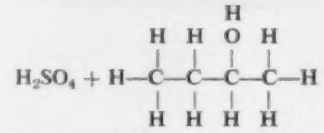


Secondary butyl sulfate

then

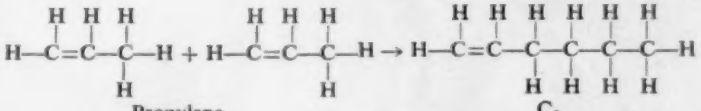


Secondary butyl sulfate — Water



Sulfuric acid — Secondary butyl alcohol

Another example is the polymerization of propylenes at a poly unit. Here propylenes are polymerized to form principally C_6, C_9, and C_{12}, primarily for use in gasoline. This is done using high temperature and high pressure and a catalyst. Again the propane in the feed passes through unchanged.



Propylene — C_6

There are other refinery processes based on polymerization, including alkylation and the manufacture of synthetic rubbers. Molecules formed by these reactions are very large and may contain over 100 carbon atoms.

Petrochemicals. Many of the products we make in the refinery are used as feed stocks in the manufacture of chemicals. Ethylene is polymerized into polyethylene which is used to make various plastic products. Ethylene can also be used to make TEL. Alcohol is used for many purposes such as making photographic film. MEK is used as a solvent and in paint removers. These are only a few of the many uses for refinery products in the chemical business.

Petroleum products manufactured at a refinery can be generally classified as gases, gasoline, middle distillates, and fuel oils. Examples of middle distillates are kerosine, diesel, and heating oil.

Years ago, only three main products were manufactured—gasoline, light fuel oil, and heavy fuel oil. Quality requirements for these products were low, and consequently they could be cut directly from the crude oil without further processing.

Today, to meet high-quality standards, as well as the demand for many more products to meet specific uses, many processes beyond initial separation of the crude oil are required.

There are, of course, many specifications to meet in manufacturing a high-grade gasoline. However, one major one, octane number, usually best tells whether the hydrocarbon mixture will make a good gasoline. The higher the octane number, the greater is the antiknock quality of the fuel. Listed in Table 1 are some typical hydrocarbons and their octane numbers.

Notice that the type of hydrocarbon compounds, which, when mixed together, give a high-quality gasoline are:

1. Short chain length.
2. Unsaturated (have double bonds).
3. Contain lots of branches.
4. Aromatic (such as benzene).

TABLE 1

	Molecular formula	Boiling point	Octane number
Ethylene	C_2H_4	−155	81M*
Propylene	C_3H_6	− 53.7	85M
Butylene	C_4H_8	21	80M
Isobutane	C_4H_{10}	13.5	99M
Isobutylene	C_4H_8	20	87M
Pentane	C_5H_{12}	97	64M
Isopentane	C_5H_{12}	82	90M
Hexane	C_6H_{14}	156	26M
Heptane	C_7H_{16}	209	0
Octane	C_8H_{18}	258	−17M
Isooctane	C_8H_{18}	210.7	100M
Benzene	C_6H_6	176.2	100+M
Toluene	C_7H_8	232	100+M

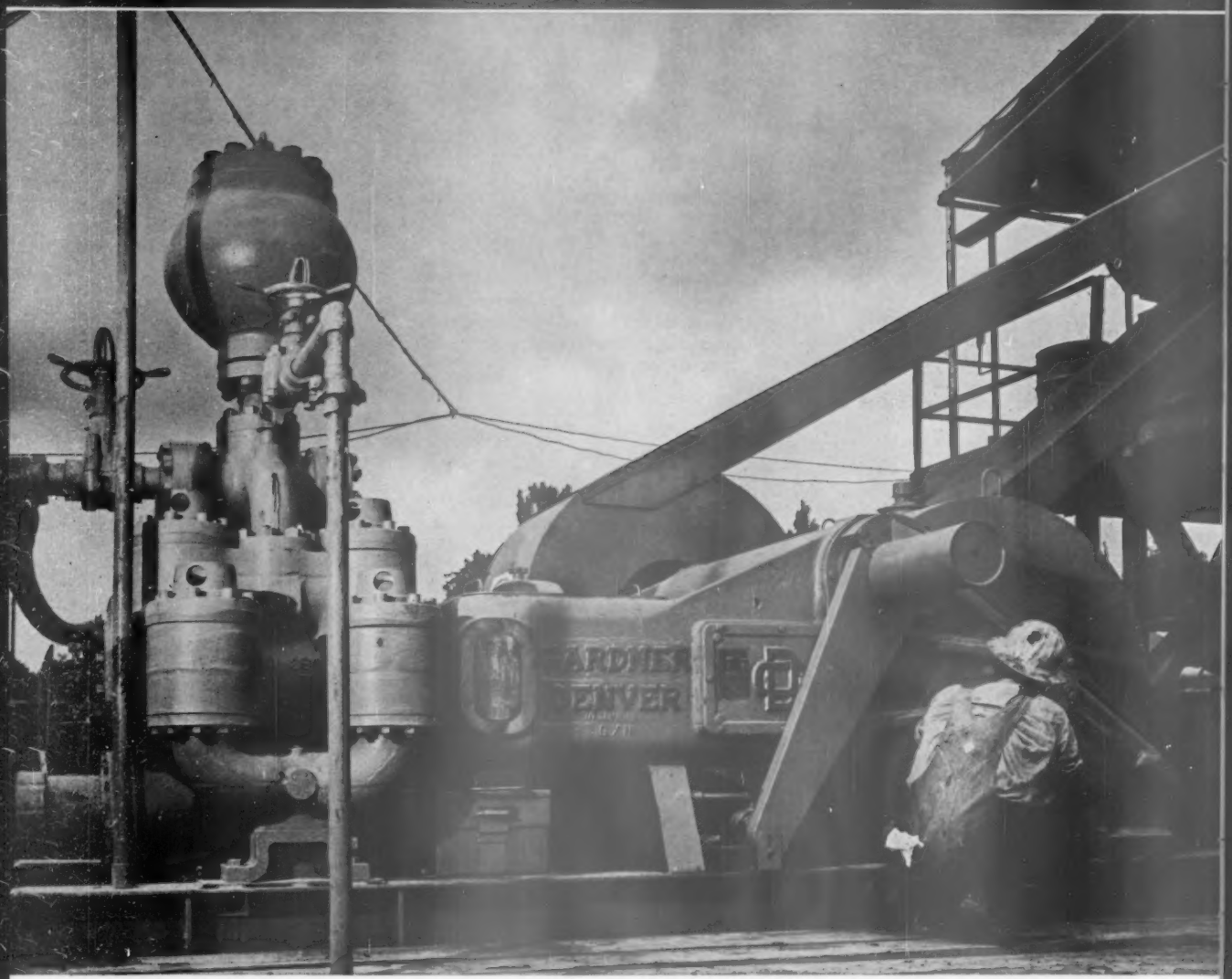
*M—Stands for motor.

Remember we must have high-octane components in a gasoline mixture if it is to be a good engine fuel. One of the older processes used to produce high-octane gasoline components is thermal cracking.

This material taken from process-training-program manual, Bayway, N. J., refinery of Esso Standard Oil Co.

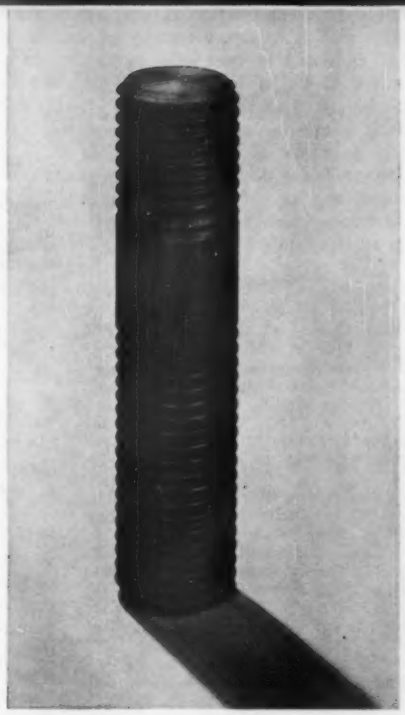
Gardner-Denver Mud Pump parts are easily replaced at the rig site. J&L Supply stores in the United States and Canada stock the parts. This is how to.....

Simplify



This GXN is one of two Gardner-Denver mud pumps in tandem arrangement on a wildcat in Louisiana. Gardner-Denver engineers designed these pumps for complete service in the field. And Gardner-Denver mud pump parts are as near as your J&L Supply store. Unitized, trailer-mounted, offshore—any rig with Gardner-Denver mud pumps is never handicapped for lack of experienced Gardner-Denver service or genuine Gardner-Denver parts.

Mud Pump Maintenance



SAFEGUARD AGAINST RIG BREAKDOWN.

There is a difference in valve cap studs. Gardner-Denver studs are machined from alloy steel and heat treated.

To avoid costly failures, damaged equipment, insist on genuine Gardner-Denver parts. Protect your investment in quality.

Ask your J&L Supply man for literature on Gardner-Denver mud pumps in sizes to 1250 h.p. for drilling to any depths.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L....It's the best available

113

BY W. L. NELSON
Technical Editor and Petroleum Consultant

Fluorosis not found in alkylation plant workmen

Have there been cases of industrial fluorosis in connection with the operation of alkylation plants? Is the process a dangerous one? G.L.W.

No cases of chronic illness due to working in HF alkylation plants have come to the attention of this department nor are such illnesses reported in the available literature. When the process was first conducted on a large scale, consideration was given[2] to the possibility of fluorosis which had been reported among cryolite workers in Denmark.

The workmen employed in some of the early alkylation plants were examined by X-ray to discover any indications of fluorosis prior to work in the new plants. Also, a method of checking the urine of the workmen at regular intervals was devised. Care was also taken in the disposal of spent neutralizing agents. No evidence of fluorosis because of work in alkylation plants was reported.

Although acid burns have been encountered[3 6], the injury rate has generally been lower than in plants that manufacture the acid, and greatly lower than in the chemical industry generally[3]. The record is probably due to the fact that everyone is alert to the inherent dangers in the use of hydrofluoric acid and to the fact that HF can easily be removed from the process streams because of its great reactiveness.

Of the 0.25 lb. of HF consumed[9] per barrel of alkylate gasoline (and many plants operate with less than 0.19 lb. loss) less than 0.00125 lb. or 5 p.p.m. escapes with the products of the plant. In one plant[10], about 0.0325 lb. is removed by bauxite treatment, and about 0.005 lb. by caustic washing of the propane product.

Solid corrosion debris accounts for some acid but probably not more than 0.002 lb. or at the most 0.005 lb. The so-called acid-oil or tar (3-6%) which is rejected from the acid regeneration system accounts for most of the rest of the acid.

The toxicity limit of HF in air for an 8-hour working day is said[3] to be about 3 p.p.m. which is a concentration of about 0.1585 lb. of HF per million cubic feet of air. To account for such a concentration in still air (which has normal convection currents) it would be necessary to lose about 0.02 lb. of HF by leaks for each barrel of alkylate produced.

It is interesting to note that enormous amounts of organic fluorine compounds are used as aerosol propellants and as refrigerants, and at least the aerosols are directly available to the lungs of anyone nearby.

References

1. Miller, H. C., "Safe Handling of Fluorine Chemicals": Chem. & Eng. News, Dec. 26, 1949, p. 3854.
2. Benson, Roy, "Safety in . . . Hydrogen Fluoride Alkylation Plants": Pet. Refiner, Dec. 1943, p. 116.
3. Fehr, C. M., "HF Safety in the Alkylation Industry"; Rocky Mountain regional meeting of WPRA, Sept. 24, 1958.
4. Toxicological Reviews of API Medical Advisory Committee (API, 50 West 50th St., New York).
5. Chemical Safety Data Sheet No. 25, Manu. Chemists Assoc. (608 Woodward Building, Washington 6, D. C.).
6. Wheeler and Judice, "HF Alkylation Unit Revamp. . .": Pet. Engineer, Dec. 1952, p. C-5.
7. Carlson, A. J., "Treatment of Hydrofluoric Acid Casualties": Univ. of Chicago (published by Universal Oil Products Co.).
8. Resen, L., "Hydrofluoric Acid Alkylation": The Oil and Gas Journal, Oct. 6, 1958, p. 224.
9. Nelson, W. L., "Operating Costs—Alkylation": The Oil and Gas Journal, April 11, 1960, p. 121.
10. Hewson, J. E., "HF Alkylation": The Oil and Gas Journal, Mar. 22, 1954, p. 190.

Gravity of oil blends

We are interested in obtaining information on the mathematical or gravity blending of oil. If you have any publication will you kindly advise. E.B.H.

The gravity of oil blends is exactly in proportion to the amounts of the oils used and their gravities except when one of the oils is extremely low boiling (liquefied gases). However, it is necessary to use true units of gravity, that is, specific gravity or the various densities such as pounds per gallon, pounds per barrel, or pounds per cubic foot. API gravity cannot be used because it is not directly related to the weight of the material.

Example: Thirty volumes of oil A are to be mixed with 70 volumes of oil B:

Oil	API gravity	Lb. per gal.*	Gallons or percentage	Gallons times lb./gal.
A	29	7.341	30	220.230
B	37	6.993	70	489.510
			100	709.740

*Obtained from tabulation of API gravity vs. lb./gal. or other densities such as in Appendix A of Petroleum Refinery Engineering, McGraw-Hill Book Co., Inc., New York, 1958.

The weight of the 100 gal. of mix is 709.74 lb. or 7.097 lb. per gal. This corresponds to an API gravity of 34.5°. This is very close to the weighted API gravities of the oils (34.6°) but the error is greater if the difference between the two API gravities is larger.

When one of the oils to be blended is a liquefied gas (ethane, propane, or the butanes), the computation is conducted in the same manner, except that a multiplier is used on the volume of the liquefied gas. Such multipliers are shown in Fig. 4-10, page 137 of the fourth edition of Petroleum Refinery Engineering. The liquefied gases occupy less volume when mixed with heavier oils than they occupy before the mixing. Thus the density of the mixture is greater than would be expected.

No magnetizable liquid

Kindly advise me if there is a liquid that can be magnetized? C.E.S.

This department is not aware of any liquid that can be magnetized, not even molten iron. Only the alpha alitropic modification of iron which occurs in the room temperature range is magnetic. At temperatures above about 1,670° F., magnetic iron changes into gamma iron which is not magnetic, and melting does not occur until 2,800° F., is attained.

Perhaps a slurry or gellike suspension of exceedingly fine particles of iron might behave like a magnetic liquid.

How to fight pretreater corrosion

• Use of intermittent water washing, inhibiting, and ammonia injection makes alloy exchanger tubes unnecessary.

CORROSION and fouling in the exchanger train following a reformer pretreater have been problems with refiners ever since hydrogen treating first came into use.

One of the chief causes of trouble is ammonium chloride. Ammonium chloride deposits plug exchangers, freeze valves closed, interfere with instrument operation, corrode valve seats and cause holes in exchanger tubes.

Another source of trouble is water. A continuous water-injection system designed to remove water-soluble ammonium chloride as it forms can aid in forming iron sulfide. The resulting deposits of iron sulfide indicate a high corrosion rate and are difficult to remove from the equipment on stream.

Refiners have tried several approaches to the problem. Among them are water washing during shutdowns, continuous onstream water washing, intermittent onstream water washing, continuous addition of inhibitor, and the use of stainless-steel alloys.

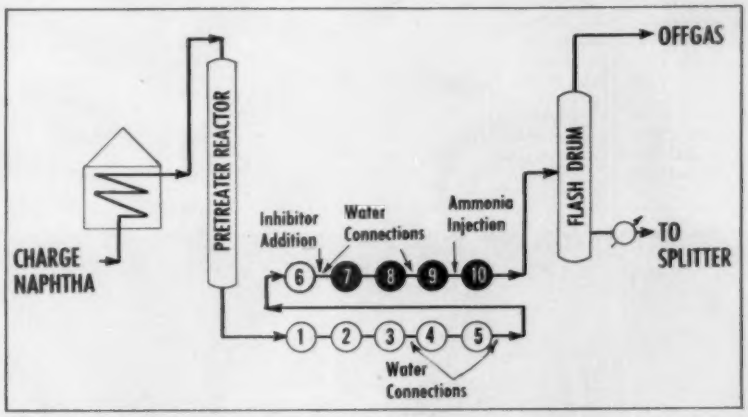
Mobil Oil Co.'s East St. Louis refinery, using a combination of these approaches, has found an effective solution.

. . . **Ammonium chloride** deposits are removed by intermittent water washing.

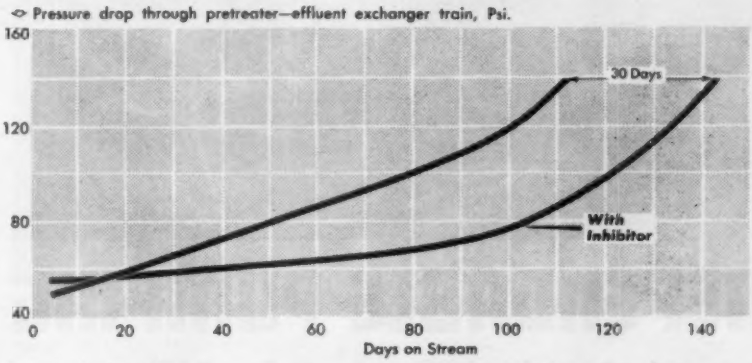
. . . **Iron sulfide** deposits are minimized by intermittent water washing.

. . . **Chloride corrosion** is controlled by injecting ammonia and a filming amine inhibitor.

As a result of intermittent washing and inhibiting, the refinery is able to use carbon-steel exchanger tubes rather than resorting to alloys for corrosion control.



IRON SULFIDE DEPOSITS build up most rapidly in the low-temperature sections of the exchanger train. Fig. 1.



EXPERIMENTAL RUNS showed that amine inhibitors would slow the rate of pressure-drop increase. Fig. 2.

BY KENNETH BROOKS
District Editor

Chloride deposits. Hydrogenation of the reformer naphtha charge not only removes sulfur as hydrogen sulfide, but also removes chlorine as hydrogen chloride and converts nitrogen to ammonia. Hydrogen chloride and ammonia, as they pass through the effluent exchanger train, condense to form solid ammonium chloride which deposits on the heat-exchange surfaces.

These deposits rapidly accumulate and plug exchanger tubes. This increases the pressure drop across the bank of exchangers and cuts run life drastically.

A plot of pressure drop in the effluent exchanger system was maintained to evaluate different approaches to the problem. Since the unit charge varies with production demands, it was necessary to correct the pressure-drop data to a base charge rate. This gave a smooth curve and allowed comparisons between different runs.

For instance, during one run at Mobil's refinery, the corrected pressure drop across the pretreater-effluent exchanger train increased from 60 psi. to 115 psi. over a period of 90 days. Unit charge was about 16,000 bbl. per day, and the naphtha contained about 0.05 wt.% sulfur, 7 p.p.m. chlorine, and about 5 p.p.m. nitrogen. Approximately 4 M.M.s.c.f.d. of hydrogen-rich gas was also charged into the pretreater reactor.

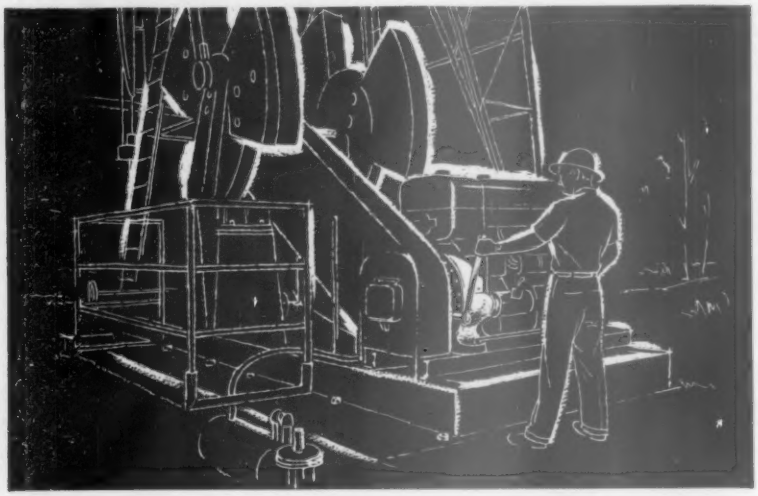
Since ammonium chloride is readily soluble in water, Mobil engineers solved the problem by using an intermittent onstream water wash. Water can be injected at any of the several points indicated in the exchanger train (Fig. 1). After circulating through the system, it is withdrawn at the flash drum. As soon as pressure drop across the exchangers has been restored to normal, water injection is stopped.

A continuous water wash is not used for several reasons. Chief among these is that water seems to promote the formation of iron sulfide deposits in the low temperature sections of the exchanger train. Increases in the amount of water used increased the deposits. The deposits are difficult to remove without shutting down and cause a large increase in pressure drop. Since corrosion rates are increased, more maintenance is therefore needed.

Aside from this, continuous addi-

TABLE 1—EFFECT OF AMINE INHIBITOR ON CORROSION RATE

Test Location—	Exchanger 5 inlet channel (Tube side)	Exchanger 6 inlet channel (Tube side)	Exchanger 8 inlet channel (Tube side)	Exchanger 10 shell cover (Inlet end, shell side)	Bottom of flash drum (Liquid phase)	Exchanger 6 shell cover (Inlet end, shell side)
Average conditions:						
Temperature °F.	480	440	334	218	148	345
Pressure, psig.	456	478	465	40	398	253
Exposure Time, days	190	190	190	190	190	190
Corrosion Rate—in. per year						
Material:						
Carbon steel, ASTM A-7	0.0050	0.0016	0.0460	0.0019	0.0014	0.0011
AISI, Type 304, 18-8S	0.0002	0.0001	0.0003	<0.0001	<0.0001	<0.0001
AISI, Type 304L, 18-8SL	0.0002	0.0002	0.0002	0.0001	<0.0001	0.0001
AISI, Type 321, 18-8T	.....	0.0002	0.0003	.....	.....	.....
AISI, Type 347 18-8C	0.0001	.....	.....	<0.0001	<0.0001	<0.0001
Iron-nickel-chromium alloy	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel-chromium alloy	0.0002	0.0001	0.0016	<0.0001	<0.0001	0.0007
Nickel-copper alloy	0.0051	0.0009	0.0031	0.0049	<0.0001	0.0009



DEPENDABLE PUMPING

with Rockford Power Take-Offs

It's no wonder why more and more oil men specify Rockford PTO's. These maintenance-free PTO's offer higher torque capacities, better heat dissipation, less lever pressure, and positive engagement. Rockford's infinite-control adjusting ring provides longer life. Smooth and instantaneous power is transmitted from any internal combustion engine to your working oil field equipment.
Write today for illustrated brochure.

ROCKFORD PTO

ROCKFORD CLUTCHES

ROCKFORD CLUTCH DIVISION BORG-WARNER

1305 EIGHTEENTH AVE.
ROCKFORD, ILLINOIS

Export Sales
Borg-Warner International
36 So. Wabash, Chicago, Ill.

tion of water will permit the water and chlorides to be carried over from the flash drum to the splitter. This in turn will plug the splitter feed exchangers, the very problem which was to be solved on the pretreater-effluent exchangers.

Chloride corrosion. Hydrogen chloride is absorbed by the water to form an acid which must be neutralized. To solve this problem enough ammonia must be injected into the pretreater system to maintain a pH above 7. On Mobil's unit about 1 g.p.m. of ammonia solution is required.

However, no ammonia injection is required when a thermal gasoline containing nitrogen is charged to the unit. The ammonia formed from this stock is sufficient to produce a pH of 8.5 in the flash drum and in the splitter overhead.

Another method of controlling chloride corrosion during water injection is to add a filming-type amine inhibitor. Not only will the inhibitor reduce corrosion rate, but it also is apparently effective in slowing the rate of pressure-drop increase. During one experiment at East St. Louis, the addition of inhibitor alone extended onstream time by 30 days (Fig. 2), based on corrected pressure-drop data.

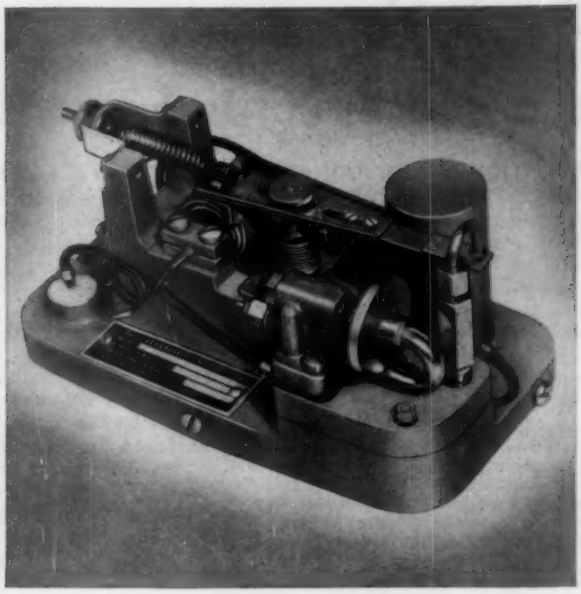
The effectiveness of corrosion inhibitor is shown by data on test coupons in the pretreater-effluent exchanger train. When inhibitor was added to the system corrosion rate for carbon steel was cut 0.011 in. per year. For 18-8 stainless steels, corrosion rate was cut 0.0014 in. per year. Inhibitor concentration is maintained at 20 p.p.m. Test data are shown in Table 1.

Acknowledgment

Credit is due Roy Held, W. A. Heideman, L. C. Daniels, and P. G. Wright, all of Mobil Oil Co., East St. Louis, Ill., for the aid and information they supplied in the preparation of this article.

The compact SENSAIRE Transmitter *measures only 7¾" x 4¾" x 4¼". Weighs only 7 lbs. Suitable for many types of application.*

Interchangeable, all-welded thermal system. *Bi-Metal case compensation. Especially desirable on low temperature applications and where mercury is not acceptable.*



New from Taylor... GAS-ACTUATED SENSAIRE* TRANSMITTER

This new version of the time-proven SENSAIRE Transmitter makes low-cost temperature measurement available for those applications where mercury actuation is not acceptable. A force-balance type transmitter, No. 202TG is compact, sturdy and extremely dependable. Adjustments are simplified; repeatability is excellent.

- **Available in 3 range spans.** 100°F., within limits of minus 400°F. to +300°F.; 200° and 400°F, within limits of minus 400°F. to +1000°F.
- **Maximum overrange protection**—100% of range span above operating range.
- **Calibration accuracy** within 1% of range span below 550°F.; 1½% above 550°.
- **Ambient case temperature limits**—minus 30° to +150°F.
- **Air supply**—20 psi recommended; 25 psi maximum.
- **Air consumption**—0.4 scfm.
- **Bulb size**—11/16" x 5⅛". (Optional capillary bulb gives temperature averaging effect. Permits variable immersion with no loss of accuracy.)

Ask your Taylor Field Engineer, or write for **Bulletin 98293.** Taylor Instrument Companies, Rochester 1, New York, and Toronto, Canada.

Easy to install. *Mounts in any position. Universal bracket provides for direct mounting on pipe, wall or wrench head of well or separable bushing.*

*Trade-Mark

Taylor Instruments **MEAN ACCURACY FIRST**

PART 2

Gas hydrates: a practical control method

INJECTION OF METHANOL is perhaps the most common method of preventing hydrates in wet-gas systems. If methanol on some other hydrate inhibitor is injected, the freezing point will be depressed in an amount directly proportional to the amount of inhibitor. Hammerschmidt has expressed this phenomenon by a mathematical equation.

(This is Part 2 of a three-part report on gas-hydrate problems and how Texas Eastern Transmission Corp. handles them. This part tells why and how the company uses methanol. Part 1 [OGJ, Oct. 3, p. 116] discussed the origin of such problems. Part 3, outlining associated preventive measures, will appear November 7.)

BY L. E. CONNEALY
Division Measurement Engineer,
Texas Eastern Transmission Corp.

$$d = \frac{KW}{100\,M - MW}$$

Where:

d = freezing point depression, °F.

K = a constant whose value depends on the solute and must be determined experimentally.

W = the solute (inhibitor) concentration, weight per cent.

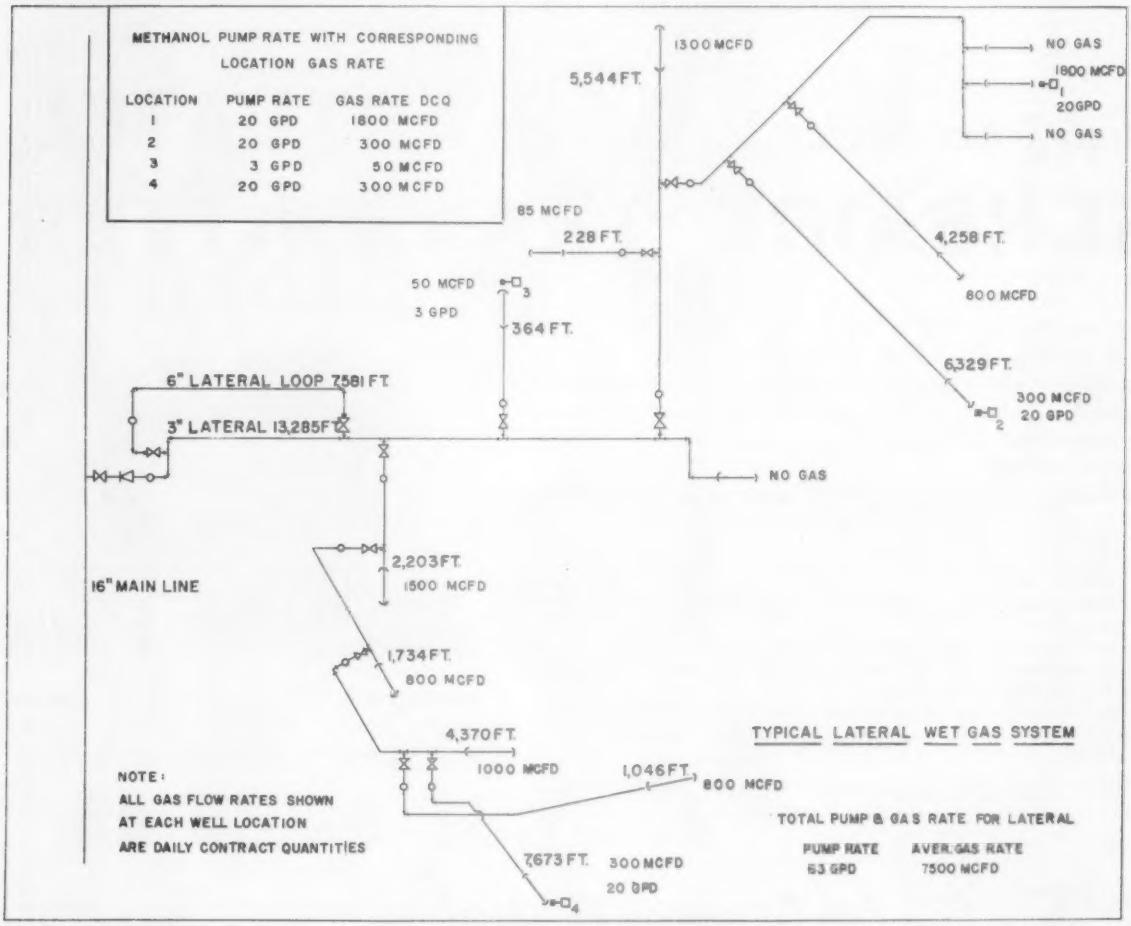
M = molecular weight of solute (inhibitor).

A table of freezing point constants is listed below:

Substance—	K	Reported by
Methanol, ethanol, isopropanol, ammonia	2,335	Hammerschmidt
Ethylene glycol, urea sodium, chloride	2,200	Powell
Ethylene glycol, propylene, glycol	3,950	Reid
Diethylene glycol	4,780 4,080 4,240 *4,367	Campbell

*Average.

Methanol is an effective antifreeze substance, noncorrosive, not chemically active, soluble in all proportion in water, and is easily obtained and reasonable in cost. The methanol will establish an equilibrium with most of it in the vapor phase, but when liquid phase is encountered it will condense enough to establish equilibrium. Some believe that for methanol to be most



TYPICAL LATERAL wet-gas system.

CENTRIFUGAL COMPRESSORS

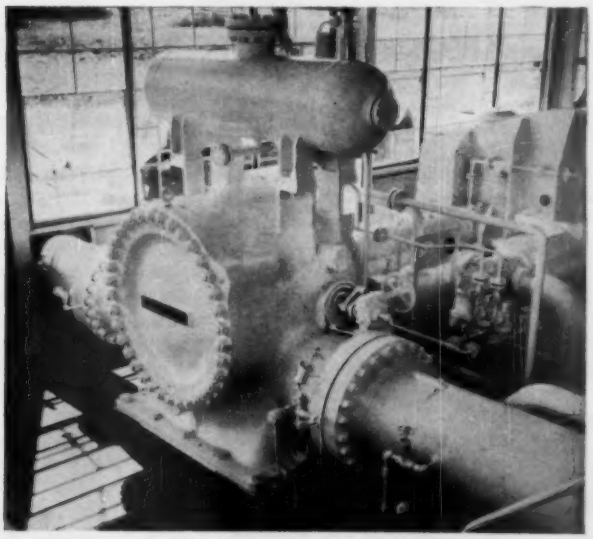
DE LAVAL welded impeller

permits higher horsepower, higher tip speeds, greater design flexibility

Now, with a single welded wheel, compressors rated up to 20,000 horsepower at 6500 rpm are giving excellent service.

Produced by a special welding process developed by De Laval, this new welded wheel construction permits higher tip speeds and fewer stages for a given pressure ratio.

Write for more information on this new welded impeller or contact your local De Laval representative.



Rated at 20,000 horsepower, this compressor, on stream for a prominent pipeline company, is capable of developing a pressure ratio of 1.56 in a single impeller, pumping 800 MMSCFD at an inlet pressure of 652 psia and an outlet pressure of 1,020 psia.

DE LAVAL STEAM TURBINE COMPANY

810 NOTTINGHAM WAY, TRENTON 2, N. J.

DL-486-B

effective it must be atomized as injected into the pipeline. Considerable success can be had by simple injection without atomizing.

Best results with greatest economy can be had if the methanol is introduced into the gas stream, by injection pumps, in small amounts on a 24-hour per day basis. Methanol is the simplest compound to use as a hydrate preventer. It is lost as additional B.t.u. in the gas that goes to sales. No method has proved practical in recovering methanol for reuse or salvage.

Texas Eastern's Program

Methanol is used on Texas Eastern's gas system, and the techniques worked out have prevented formation of hydrates, allowing this wet-gas system to flow during severe winter weather. Enough alcohol is injected at various locations to prevent hydrate formation. Most injection points are at measuring stations on laterals.

Texas Eastern's wet-gas system is composed of 145.35 miles of 14 and 16-in. main with a 16-in. loop 16.32 miles long and 254.01 miles of laterals varying in size from 3 to 8-in. The laterals form a network along the length of main line, and many of the laterals have branch lines off branch lines, making a very complex system.

The wet-gas system is unique in that all liquids entering the system or condensing in the lines are transported the full length of the line to a gasoline plant. The liquids must be transported because of an agreement with another company that owns the gasoline plant at the terminus of the line. At the compressor stations the liquid portion is separated from the gas stream before compression and is forced back into the line after the gas has been compressed. Water that is settled out at the compressor stations when liquids are separated is blown to disposal pits.

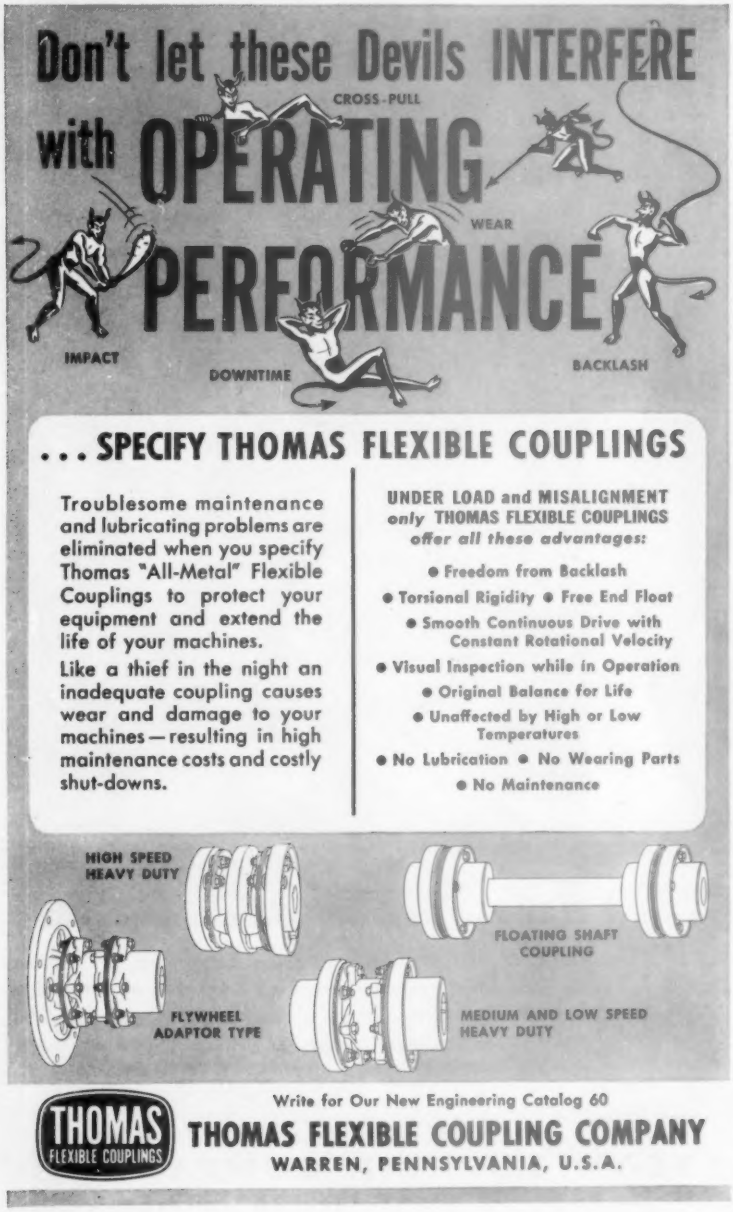
Trouble areas. Most hydrate problems occur on the laterals. In winter, methanol is injected into these laterals, principally at the meter runs, because the runs are located at the beginning of the lateral. On some laterals, particularly those with loop lines, it is necessary to inject additional methanol at points along the lateral. The methanol injected into the laterals travels with the gas stream and helps prevent freezing in the main line.

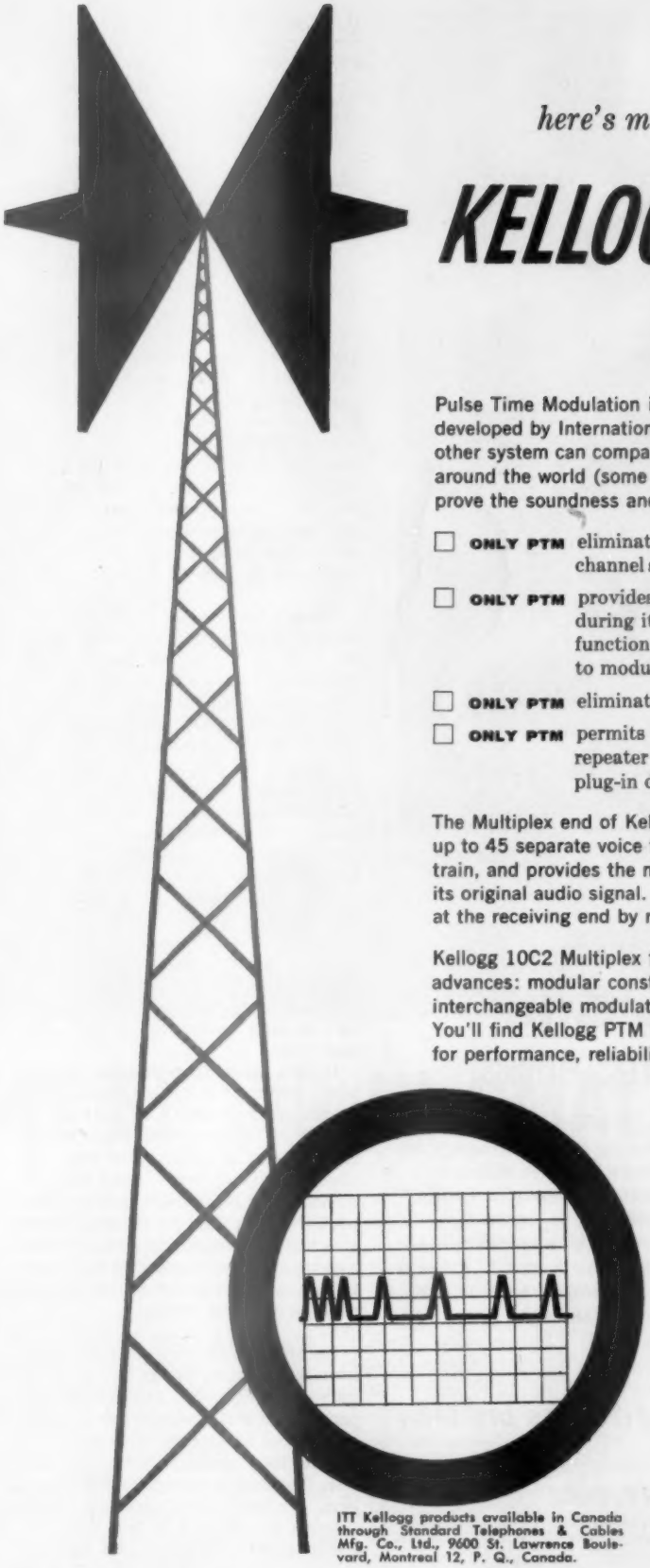
It is important that the main line be kept free of hydrates. A hydrate block in the main line would curtail all gas deliveries, while the loss of minor gathering lines or a main lateral is not nearly so critical. As a small portion of the system, it can be isolated from the main portion and cleaned easily.

During extremely cold weather it is sometimes necessary to introduce extra quantities of methanol into the main-line gas stream to insure against hydrates forming. This additional methanol can be introduced at pig traps, at main-line blowoffs, or at any appurtenance available on the main line. It is not possible to estimate the exact amount of excess methanol that will be needed, so enough is introduced to insure complete safety.

Turbulence factor. When the gas reaches the compressor stations hydrate troubles may show up. Their formation may be accelerated by turbulence caused by station suction. Alcohol-pump facilities must be provided at the compressor station to insure against a hydrate forming in gas-liquid-separating equipment. Sometimes an excessive pressure drop will occur due to hydrates trying to form in the liquid separator. When this occurs, injection of alcohol into the vessel will quickly break up the hydrates.

At one location a pump is hooked


Don't let these Devils INTERFERE
with OPERATING
PERFORMANCE
CROSS-PULL
WEAR
IMPACT
DOWNTIME
BACKLASH
... SPECIFY THOMAS FLEXIBLE COUPLINGS
Troublesome maintenance and lubricating problems are eliminated when you specify Thomas "All-Metal" Flexible Couplings to protect your equipment and extend the life of your machines.
Like a thief in the night an inadequate coupling causes wear and damage to your machines — resulting in high maintenance costs and costly shut-downs.
UNDER LOAD and MISALIGNMENT only THOMAS FLEXIBLE COUPLINGS offer all these advantages:
• Freedom from Backlash
• Torsional Rigidity • Free End Float
• Smooth Continuous Drive with Constant Rotational Velocity
• Visual Inspection while in Operation
• Original Balance for Life
• Unaffected by High or Low Temperatures
• No Lubrication • No Wearing Parts
• No Maintenance
HIGH SPEED HEAVY DUTY
FLOATING SHAFT COUPLING
FLYWHEEL ADAPTOR TYPE
MEDIUM AND LOW SPEED HEAVY DUTY
Write for Our New Engineering Catalog 60
THOMAS FLEXIBLE COUPLINGS
THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.



here's microwave at its simplest and best!

KELLOGG 10C2 PTM MICROWAVE

Pulse Time Modulation is the foolproof microwave pioneered and developed by International Telephone and Telegraph Corporation. No other system can compare with it in simplicity and reliability. Installations around the world (some dating back to ITT's early systems in the '30's) prove the soundness and reliability of PTM.

- ☐ **ONLY PTM** eliminates complicated tuning or filtering for voice channel separation. All demodulators are interchangeable.
- ☐ **ONLY PTM** provides separate and distinct channels, open only during its own time interval. Therefore S/N is not a function of channel loading; each channel is insensitive to modulation on the other channels.
- ☐ **ONLY PTM** eliminates frequency displacement over the voice channels.
- ☐ **ONLY PTM** permits *any number* of channels to be dropped at a repeater station. Only one additional modulator and one plug-in demodulator are required to drop each channel.

The Multiplex end of Kellogg 10C2 Microwave system can combine up to 45 separate voice frequency channels into a Time-Modulated Pulse train, and provides the means for restoring each of the channels into its original audio signal. Each signal is sorted into its proper channel at the receiving end by means of the distinctive marker pulse it carries.

Kellogg 10C2 Multiplex features the latest and most efficient engineering advances: modular construction, printed circuitry, plug-in channel units, interchangeable modulators and demodulators, and many others. You'll find Kellogg PTM Microwave meets your highest specifications for performance, reliability and engineering design.

ITT Kellogg products available in Canada through Standard Telephones & Cables Mfg. Co., Ltd., 9600 St. Lawrence Boulevard, Montreal 12, P. Q., Canada.

ITT KELLOGG

A Division of
International Telephone & Telegraph Corporation
6650 South Cicero Avenue, Chicago 38, Ill.

Telephone and Transmission Dept.
2912 Wake Forrest Road, Raleigh, N. C.

Regional Offices and Warehouses:

CALIFORNIA: 23 Broderick Road, Burlingame, California, OXford 7-5780.

GEORGIA: 1594 Southland Circle, N. W., Atlanta 18, Ga., SYcamore 4-2441.

ILLINOIS: 4600 So. Tripp Ave., Chicago 32, Illinois, CLiffside 4-4300.

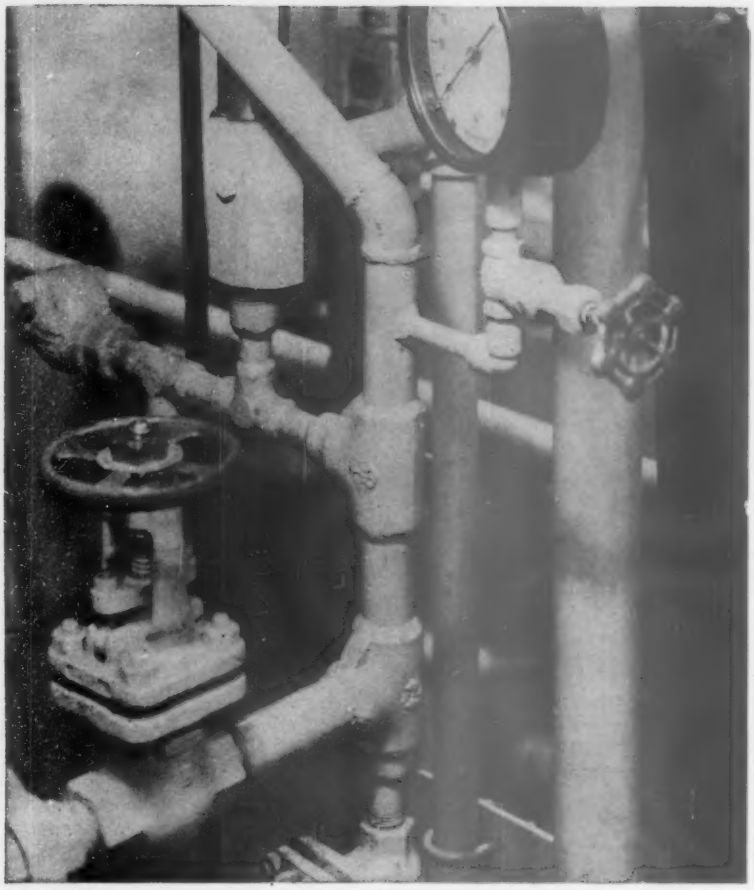
KANSAS: 7th & Sunshine Road, Kansas City 15, Kansas, MAyfair 1-4418.

NEW YORK: 327 North West Street, Syracuse, N. Y., HArrison 2-9251.

TEXAS: 1359 Motor St., Dallas 7, Texas, Riverside 7-3191.

HAWAII: 178 Kalaheo, Kailua, Oahu, Hawaii, 268242.

EXPORT: 4600 So. Tripp Ave., Chicago 32, Illinois, CLiffside 4-4300.



Forged stainless steel 150 lb. socket weld W-S Fittings on tank piping at E. R. Squibb & Sons plant, New Brunswick, N. J.

To Beat Corrosion's Bite

—W-S FORGED 150 LB. STAINLESS FITTINGS

They're ideal for standard pressure services (300 p.s.i. cold, non-shock and 150 p.s.i. steam pressure) requiring corrosion resistance or toughness at low temperatures.

But maybe your next installations call for forged aluminum fittings, or forged carbon steel fittings, or forged stainless and alloy fittings for higher pressures. W-S specializes in designing and making them all to top standards of safety and high strength . . . with outstanding resistance to shock, heat, vibration.

For specifications and distributor locations, write *Forge & Fittings Division, H. K. Porter Company, Inc., Box 95, Roselle, N. J.*

FORGE AND PORTER FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

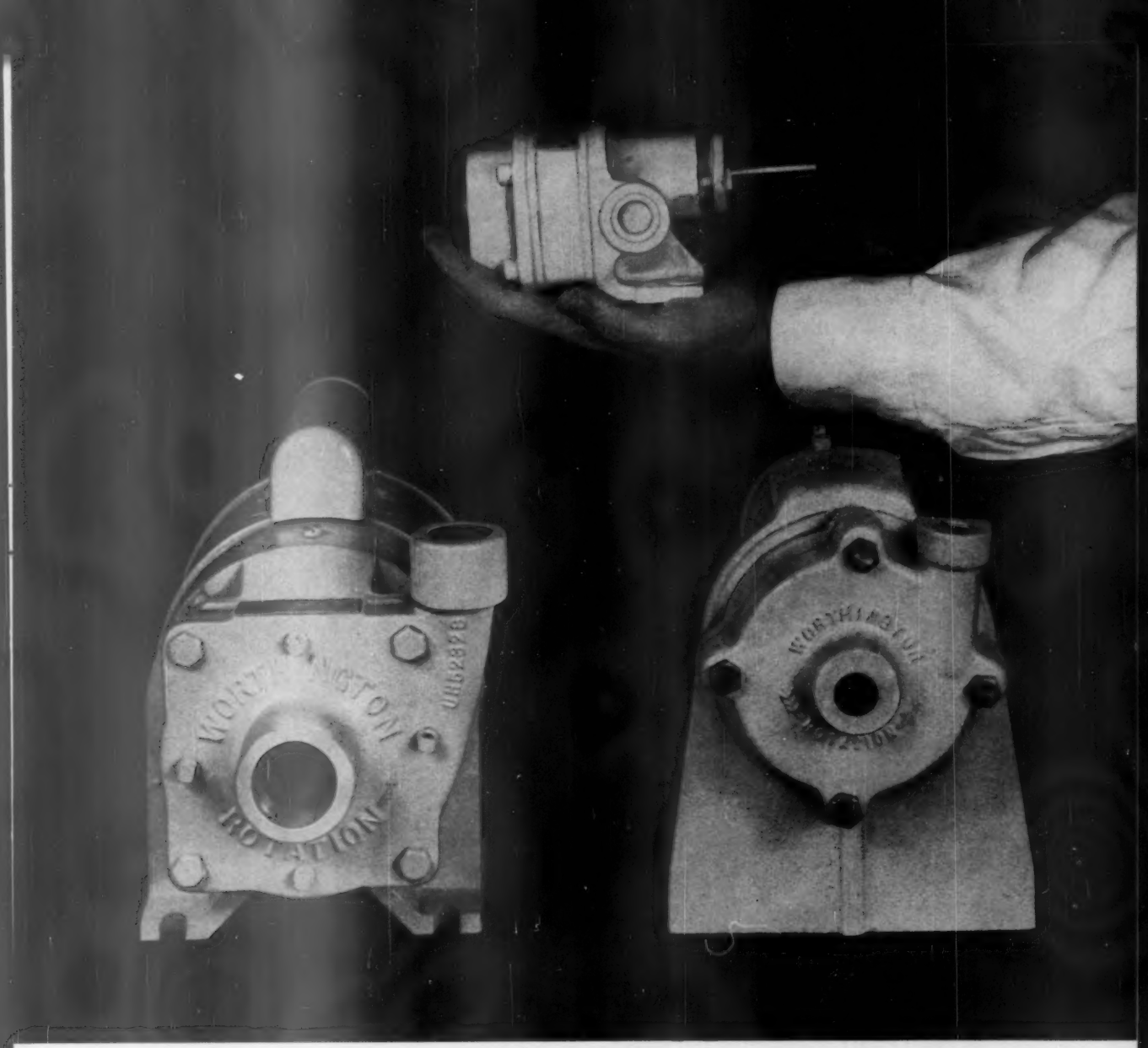
up to inject automatically when the pressure drop exceeds 2 psi. During the severest winter weather the pumps at compressor stations will be operated at low rates at all times. As the gas stream coming in becomes colder, pump rates are adjusted to higher rates.

Measurement of wet gas becomes much more of a problem during winter when hydrates can form in either the meter run or meters. Hydrates have been forced through meter runs with enough force to break loose straightening vanes and break off thermometer wells. Each winter hydrates buckle orifice plates when forced through the meter run into the pipeline. It might be wise on wet-gas systems to design meter runs without straightening vanes, and install thermometer wells at an angle to offer less restriction to flow of hydrates.

Meter problems. At measuring stations where the gas is delivered above the hydrate formation temperature, there will be very little freezing in the primary measuring element. However, problems of freezing in the secondary element or meters themselves will still be present. To prevent freezing in the meter run it is necessary to elevate the temperature of the gas, raise the temperature at the point of measurement with an outside heat source, or inject enough antifreeze to prevent freezing. Hydrate formation will occur principally during days when the ambient temperature is low and it is difficult to say what remedial action to take. This is especially true in South Texas where the day-time ambient temperature is mild except for a few days each year.

If the measuring station is one where methanol is being injected, meter-run troubles are taken care of. In measuring stations—where gas enters the meter at a temperature near the hydrate point or below—and there is no antifreeze injection, it is almost impossible to keep the gas flowing. There also will be frequent freezeups in the meter-run orifice taps, making it extremely difficult to get a readable and meaningful chart record.

Location helps. Prevention of problems with meters themselves is more difficult and requires considerable expense. The meter should be as close as possible to its taps, with piping to permit fluid drainage back into the line. Installation of condensing chambers, overhead piping, and use of insulation to hold in heat will help ease meter-freezing problems. All leaks in



WE'RE BIG IN SMALL PUMPS, TOO

Yes, we're big in small pumps, too . . . so big that we have a complete, separate plant* for their production. But the real proof of how we can meet your small pump needs lies in the extent of our small pump lines. Look how these three new models stretch down to cover many more "small pump" applications.

Look at the new 1″ Centrifugal which efficiently handles small flows from 2 to 80 gpm at heads to 110 feet. It's competitively priced, compact and trouble-free with smoother waterways and higher efficiencies.

Or look at the rotary which performs down to 4 gpm (150 psi) at 1750 rpm. It has one stuffing box to minimize leakage, few moving parts to cut maintenance, excellent suction lift, four-bearing construction, and the herring-bone gears that are quieter and more efficient than spur gears.

For chemical and related industries, there is the new ⅜″ Worthite pump with capacities to 18 gpm and heads to 55 feet. It has all the corrosion-resistant advantages of larger Worthite standard centrifugal pumps.

There are, of course, special advantages in buying small pumps from Worthington. One is that you're getting Worthington "big pump" quality. Another is that the small Worthington pumps are stocked and serviced coast-to-coast. Thus you can standardize in many locations and still get quick pump service anywhere. (Original equipment manufacturers, take note!)

For more information write Worthington Corporation, Section 20-25, Harrison, New Jersey.

*Located in East Orange, N. J. Our main large-pump plant is in Harrison, N. J.

WORTHINGTON

October is Gasoline Tax Reminder Month!

It's the anniversary of the latest temporary Federal gasoline tax increase!

Every oil man and woman should be keenly aware that October is gasoline tax reminder month. October 1, 1959, was the day the temporary 1¢ increase in the Federal gasoline tax went into effect, making the total Federal tax 4¢ a gallon. That's why October is an excellent time for you to remind your friends and business associates about high gasoline taxes. And make sure they know that Congress promised this temporary tax increase would expire on June 30th, 1961 . . . and the Federal tax revert to 3¢ a gallon.

Here are the facts about high gasoline taxes that everyone should know:

- **Motorists pay about one dollar in taxes on every ten gallons of gasoline they buy!**
- **The gasoline tax rate is five times as high as the tax on luxuries like diamonds and mink coats!**
- **Motorists now pay about a 50% sales tax on gasoline!**

So, take advantage of this special gasoline tax reminder month and give your friends the facts about high gasoline taxes.

COMMITTEE ON PUBLIC AFFAIRS OF THE AMERICAN PETROLEUM INSTITUTE
1271 AVENUE OF THE AMERICAS, NEW YORK 20, NEW YORK

meter piping must be eliminated and a high-quality valve used for the meter taps and manifolding. Steel tubing combined with condensing chambers serves meter-manifolding needs most adequately.

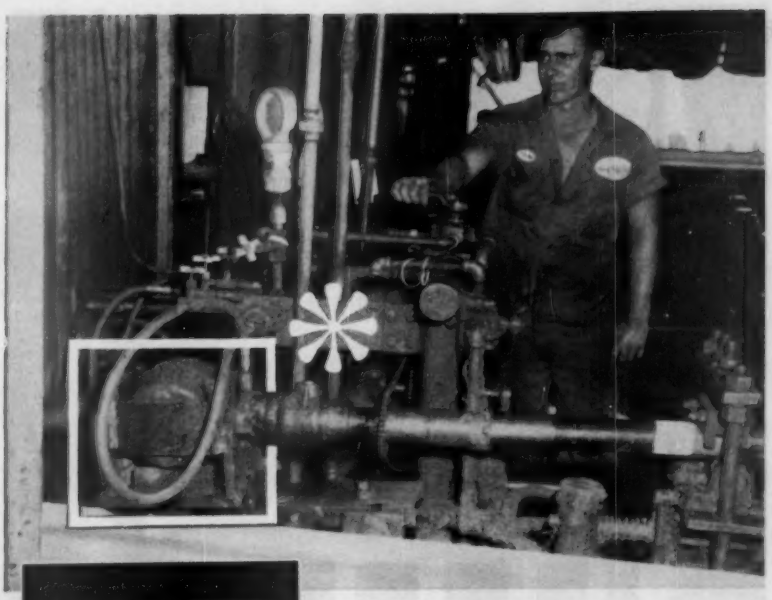
The use of the bellows or diaphragm-type orifice meters for wet-gas measurement is recommended. By using a seal of equal amounts of glycol on each side of the bellows and with the meter located as near the orifice as possible, most meter freezing will be eliminated. This is especially true in areas such as South Texas where the temperatures are not too severe.

When mercury meters are used to measure wet gas, considerable time and expense is needed to keep them operating during the winter season. Careful attention to piping the meters and the use of good valves and condensing chambers will keep maintenance of mercury meters at a reasonable level.

Preplanning. In winter operation all of the problems involved in wet-gas measurement are intensified. Pipeline, measurement, and compressor station work is more complicated and critical than it is on a dry-gas system. To prepare for and to set up a plan for winter, a meeting of field personnel at headquarters is of invaluable assistance. The personnel in each area can bring up individual problems and acquaint the office with ideas on where trouble will occur and how this winter might be improved from the previous one. Knowledge gained the preceding winter can be reviewed and shared by all personnel and a better plan can be formulated for the ensuing winter.

Each year new areas will give trouble and in some cases trouble will be alleviated. The field force is familiar with producing characteristics of individual wells, and with their information and that of other departments, a workable plan can be established before winter starts. If a well is worked over or has water squeezed off, it will probably offer less trouble than it had previously. Normally there are not many workovers to consider.

In a system where hydrate prevention is accomplished by injection of methanol, it is most important to know the location of each pump and to have an injection rate at which to start the pump when conditions favorable for hydrate formation are reached. Each alcohol pump should be repaired after each winter's operation, and checked to be sure it is in good operating condition before the



HAMER

. . . only valve to stay in service, operating 800 times per day at 10,000 psi.

Hamer "D" Series Plug Valve

Hardy-Griffin Engineering Corporation's program of testing 800 joints of oil field tubing a day at pressures of 10,000 pounds had been a valve killer with failure often occurring two or three times a day.

A HAMER "D" SERIES 2" MODEL DR150W PLUG VALVE was placed in service in January, 1959, and OPERATED FOR THREE MONTHS WITHOUT MAINTENANCE. The segments were then reversed and used another three months, then replaced. The HAMER Valve always seals bubble tight.

For reliable valve service talk to your Hamer Valve specialist.

* Chiksan Swivel Joint allows quick coupling of pipe to pressure unit . . . holds pressure without leaking.

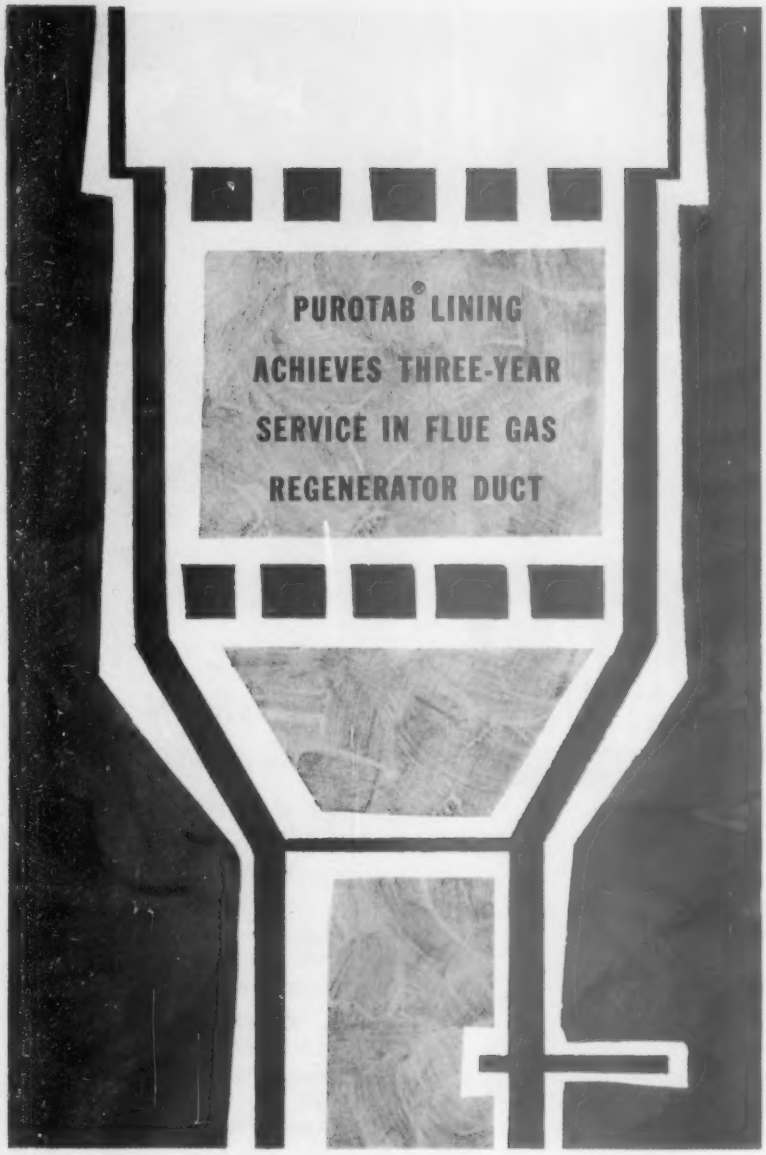
WECO WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS
Division of CHIKSAN COMPANY a subsidiary of FOOD MACHINERY AND CHEMICAL CORPORATION
HV-4-60
fmc

WECO UNIONS

CHIKSAN SWIVEL JOINTS

HAMER LINE BLIND VALVES

HAMER PLUG VALVES



In July, 1957, a leading refinery in the Midwest slap-troweled Purotab castable into a hex-steel facing of a flue gas regenerator duct to make a ¾" to 12" lining.

Now after more than three years on line, this Purotab lining remains serviceable with very minor patching.

Performance like this shows the value of a premium refractory castable designed especially for extreme erosive conditions. Purotab is a high-alumina castable containing a high-purity, high-strength binder. It creates an extremely dense, hard-surfaced lining serviceable to 3400 degrees.

The very low iron content of Purotab makes it suitable for long service in the reducing atmospheres of refinery cyclones, regenerators, and lines—wherever duty is most severe.

For full details about Purotab and other Kaiser refractories for the petroleum industry, call or write Kaiser Refractories & Chemicals Division, Dept. PE-407, Kaiser Aluminum & Chemical Sales, Inc., at any of the Division Offices listed below:

PITTSBURGH 22, PA. . . . . 3 Gateway Center
MEXICO, MISSOURI . . . . . Mex-R-CO Building
OAKLAND 12, CALIF. . . . . 300 Lakeside Drive

KAISER REFRACTORIES

High Alumina, Fireclay, Graphite, and Silica Refractories • Periclase Brick, Mortars, Grains and Ramming Mixes

next winter operations start. Because most pumps are delicate machines, they must be protected from contamination with dirt, rust, and other foreign material that might stop their operation.

Reserve tanks. Alcohol reserve tanks for each pump need to be protected from corrosion. Each tank should be filled with an inhibited solution during the months it is idle to protect against formation of rust and scale. Texas Eastern has put such a plan into effect to protect field facilities until the next winter.

After winter plans are formulated and all field equipment is set and in good operating condition, there needs to be a criterion for beginning injection. The best guides are the ground temperature or suction temperature at compressor stations. These temperatures reflect the flowing-gas temperature at pipeline depths.

Locations that have given the most trouble in the past may require special considerations. It may be desirable to isolate a troublesome lateral line and to clean it with pigs, to begin injection of alcohol before the hydrate point has been reached, or to distribute an equilibrium of methanol with the other liquid laying in the lateral.

Early injection. Last winter injection at low rates was begun on certain laterals known to give trouble, well ahead of the hydrate season. This worked in nearly all cases. If the exact amount of fluid existing in each lateral was known it would be feasible to start injection at a preset time. Thus the adjustment between winter and summer operations would be a relatively smooth transition. Because this information is not available, however, it is necessary to proceed by feel and instinct rather than by a definite, considered plan based on exact knowledge. Considerable success may be had in hydrate prevention by beginning injection before the time of actual hydrate danger. The methanol will then be in equilibrium with other fluid in the line when hydrate problems arise.

For locations without a history of serious hydrate problems, methanol injection should be started as soon as the ground temperature has reached a preset minimum. It is not possible to completely eliminate freezing by this method, but operations will be simplified and fewer complications will arise if these precautions are taken. There is always the possibility that some alcohol may be wasted by beginning injection before hydrates are evidenced, but in most cases the loss will be small compared to the increased ease of operations.

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Crawler-mounted trenchers

. . . of 9, 12 hp. now being produced promise to be especially suited to applications where traction or flotation is marginal, or where a considerable amount of maneuverability is needed. Machine, completely self-propelled, is equipped with a steering device which is claimed to make maneuverability easy.

Potential uses include digging trenches in rocky soil and digging foundation footings. Source: **Charles Machine Works, Inc., 1959 W. Fir Ave., Perry, Okla.**

dial that revolves once in a 96-hour period. Schedules are set with tabs affixed to the dial face.

Programs may be scheduled in any variation of 1-hour increments. The unit comes in special outdoor housings or with only a bracket for panel mounting. Source: **Tork Time Controls, Inc., Mount Vernon, N. Y.**

●

Two-way radio

. . . fits in a pocket providing a way for better coordination of construction projects. Called a Pocketphone, the radio is no wider than a pack of cigarets and less than twice as tall. Its effective range is said to be about 1 mile under average conditions. In areas where the surrounding noise makes hearing difficult or where privacy is desired, plug-in earphones are available. The maker claims the small rechargeable battery used will last a year or more. Source: **Globe Electronics Div. of Textron Electronics, Council Bluffs, Iowa.**

All-steel rolling step platform

. . . is now available with a locking mechanism that automatically locks the ladder to the floor when you first step on the ladder. A slight pressure on the release bar quickly readies the platform for movement to a new spot, according to the maker.

The platform comes in models for working heights to 15 ft. Source: **Louisville Ladder Co., 1101 W. Oak, Louisville, Ky.**

●

New time switch

. . . for pumping wells is available that, according to the maker, permits different groups of wells to pump each day, with individual programs for each group. The Model 96H8001 multicontrol time switch features a

Want more facts about equipment or copies of product literature described in this issue?

Send this Showcase Coupon

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number .....

.....

Described in OIL and GAS JOURNAL - Issue of October 17, 1960

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

Standardize on Thompson OIL WELL PUMPS

Sand Protected SUB-SURFACE ROD PUMPS

Self-Aligning
SAND SEALED-OFF ROD PUMPS
Figs. 600, 800, 900

Inverted combination single or double plunger self-aligning pumps, equipped with sand flush valve

- Cleans barrel every stroke
- Sand deposited in blind cage, discharged every stroke
- Plunger bottom sealed to prevent slippage
- Fits any API seating device; use adapter for other types
- Full working stroke assured

Fig. 201A

COMBINATION
ROD GUIDE and PARAFFIN SCRAPER

Exclusive Thompson device, standard with many operators!

- Reduces rod & pump wear
- Insures proper alignment
- Removes paraffin ahead of pump
- Allows pump to pull freely

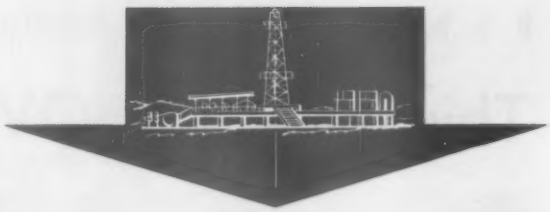
SERVICE STORES for your convenience! Stores have service men as well as salesmen to serve you . . . prompt pick-up and delivery!

SERVICE STORES
Drumright, Okla.-Ph. 462
Edmond, Okla.-Ph. 126
Eureka, Kansas-Ph. 1479
Healdton, Okla.-Ph. 668
Heidelberg, Miss.-Ph. 3871
Kilgore, Tex.-Ph. 3614
Natchez, Miss.-Ph. 4795
Oil City, Miss.-Ph. 4615
Reed City, Mich.-Ph. Tenn 2-2461
Seminole, Okla.-Ph. 610
Shidler, Okla.-MI 3-2011
Stephens, Ark.-ST 6-5487
Vivian, La.-Ph. 3680

SUPPLY STORES
Kemp Oil Well Supply, Gainsville, Texas
John & Paul Pump & Supply, Gladewater, Texas
Jack Yates Pipe & Supply Co., Gladewater, Texas
Midway Pipe & Supply Co., Greggton, Texas
W-B Pump & Supply Co., Pampa, Texas
B-H Pump Service, Selman City, Texas
Happy Co., Salem, Illinois

Thompson PUMP COMPANY

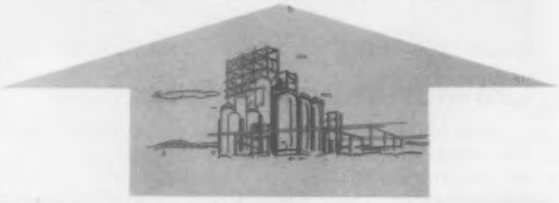
Drawer 591 — Okmulgee, Oklahoma



OIL LOANS

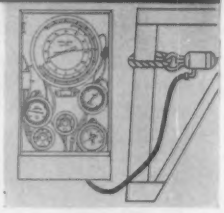
THE 1ST NATIONAL BANK OF SHREVEPORT
LOUISIANA'S OLDEST BANK

OIL AND GAS DEPARTMENT
ROBERT F. CASHEN *Assistant Vice President and Manager*

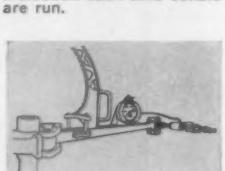


TONG TORQUE

THE MARTIN-DECKER TONG TORQUE ASSEMBLY FOR ALL CONNECTIONS



PERMANENT INSTALLATION
The cylinder attached to the back-up line provides torque indication each time collars are run.



PORTABLE INSTALLATION
The torque assembly attached to the tong itself can be used for spot checks on two or more rigs.

ONE GAUGE for torque measurements of all size drill collars, drill pipe, tubing and casing.

ACCURATE AND RELIABLE readings with calibration checks seldom required.

CARE AND MAINTENANCE can be capably done by the drilling crews.

MARTIN DECKER

WRITE FOR DESCRIPTIVE LITERATURE D-P95
MARTIN-DECKER CORPORATION
3431 CHERRY AVENUE, LONG BEACH 7, CALIF.

World's principal manufacturer of Oil Well Drilling Instrumentation

Safer wire-line stripping offered

. . . with a product now available, a hydraulically operated wire-line stripper, that has a positive latch arrangement which reportedly will not release by accident. Yet the mechanism is activated by the rope socket striking the bottom of the stripper. When the HAR stripper is released, a rubber shock absorber cushions the blow of the rope socket.

The stripper can be operated from the derrick floor. Suggested applications include swabbing of tubing, coring, sidewall sampling, and well logging. Source: **King Oil Tools, Box 15146, Houston 20, Tex.**

●

Check valve

. . . connects to three tanks simultaneously. The Model 41OT valve is an extractable angle type for use in the suction lines of gasoline and fuel-oil storage tanks to prevent drainage when pumps are not in use and to keep fuel in the lines for fast dispensing.

The valve is installed directly into a 3½-in. tank opening and can be made accessible through an extended pipe. Source: **Universal Valve Co., Box 444, Elizabeth, N. J.**

●

Rupture disks

. . . in many sizes, shapes are available designed to withstand operating pressures closer to rupture pressure than has been considered acceptable for conventional prebulged rupture disks, according to the maker. The Fike rupture disks are constructed from various thicknesses of ductile metals, come in sizes from ⅛ through 30 in., and are rated for pressures from 5 to 50,000 lb. The disk assemblies consist of the disk and vacuum support and come in bolted, union, and screw type of designs. Source: **Fike Metal Products, Blue Springs, Mo.**

●

Fire rescue suit

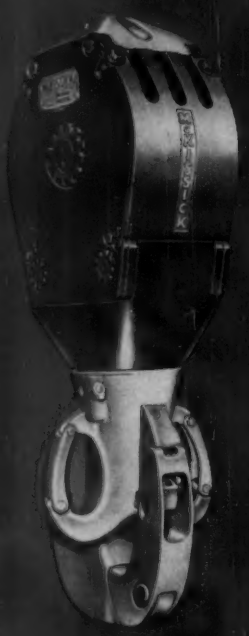
. . . features a number of improvements over older fire-fighting and safety apparel. These include a contoured headpiece to offer wide vision.

The double windows are secured by lock-on brackets that make the windows air and watertight, the maker

UNLIMITED!

RANGE OF SIZES AND CAPACITIES

More speed of operation. Free fast fall . . . More round trips per given time . . . More speed for stringing up, assured by exclusive E-Z opening guards . . . More efficient operation assured by divider plates between each sheave, eliminating center pin deflection . . . Alloy Steel flame-hardened sheaves, machine grooved to proper line size . . . More positive grease retention assured by Johns-Manville "Klipper" grease seals.



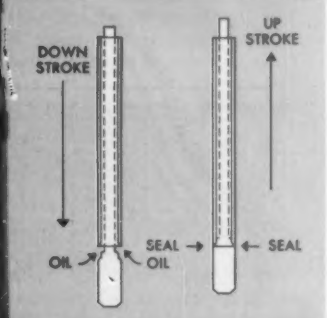
McKISSICK BUILDS A BETTER BLOCK FOR EVERY PURPOSE!

McKissick

McKISSICK PRODUCTS CORPORATION • BOX 2496 • TULSA, OKLAHOMA

An Exclusive, Patented Feature makes REYNOLDS the Pump that Will NOT GAS LOCK!

To date **every production man who has seen the cutaway model of the REYNOLDS Pump has admitted that the no-gas-lock feature is an amazing invention that someone should have thought of long ago!**



* The REYNOLDS traveling valve sleeve floats free on the rod. On the down stroke, the sleeve moves up to leave large opening for flow of oil. On up stroke, sleeve locks tight to hold oil. Normal friction of sleeve on tube assures positive operation regardless of gas pressure.

This same no-gas-lock feature enables the REYNOLDS Pump to increase production of most low-production wells, and also pump low gravity oil profitably. Try a REYNOLDS Pump in one of your wells. You will be surprised at the results. The prices of REYNOLDS Pumps are comparable with ordinary pumps that do not have the no-gas-lock feature.

DISTRIBUTORS

ILLINOIS
Salem—Precision Pump & Valve Co. P. O. Box 408

KANSAS
Ellinwood—Cherokee Pump & Service Co., Ellinwood, Kansas
Wichita (Office only)—Midland Supply Co., P. O. Box 3105
Augusta—Midland Supply Co. Augusta, Kansas
Eureka—Midland Supply Co. Eureka, Kansas

NEW MEXICO
Eunice—Precision Pump & Supply Co. P. O. Box 1105
Artesia—Allied Supply Co. Artesia, New Mexico
Lovington—Lovington Pump Co. Lovington, New Mexico

OKLAHOMA
Bristow—McAdams Pipe & Supply Co. P. O. Box 658
Drumright—King Pump & Supply Co. P. O. Box 764
Blackwell—Blackwell Pump & Supply Co., P. O. Box 548
Cement—B & S Pump & Supply Co. P. O. Box 771
Seminole—Brewer Pump & Supply Co. P. O. Box 1324
Hominy—Midland Supply Co. Hominy, Oklahoma

TEXAS
Coleman—Bradford Supply Co. Coleman, Texas
Freer—Tate Supply Co. Freer, Texas
Fort Worth—Fort Worth Pipe & Supply Co., P. O. Box 2108
Abilene—Fort Worth Pipe & Supply Co., P. O. Box 1691
Monahans—Fort Worth Pipe & Supply Co., Monahans, Texas
Knox City—Spencer Oil Field Sales Knox City, Texas
Andrews—Davis Electric Co. Andrews, Texas
Carrizo Springs—Rodman Supply Co. Carrizo Springs, Texas
Holliday—Holli-Tex Supply Co. Holliday, Texas
Ira—Jones Equipment Co. Ira, Texas
Pampa—Southwell Supply Co. P. O. Box 392
Pettus—Barnard Pump Sales & Service Co., P. O. Box 292
Midland (Office only)—Gist Speciality Co., 103 V. J. Tower Bldg. (Main Office)
Odessa—Gist Specialty Co. P. O. Box 47

WYOMING
Casper—Rocky Mountain Pump & Supply Co., 333 Elm Street

(Partial List)

See Our Exhibit at the ODESSA OIL SHOW

Reynolds
NO GAS LOCK
OIL WELL PUMPS
OKLAHOMA CITY

REYNOLDS OIL FIELD SALES CO.
1540 S.E. 29th St., Oklahoma City, Okla.

says. The inner window is of a thick, heat-resistant material of high transparency. The outer window is of a gold-filmed heat-resistant plastic. Source: **Wheeler Protective Apparel, Inc., 228 W. Huron, Chicago, Ill.**

●

Ladder

. . . rolls up for carrying like a suitcase or for transport in the trunk of a car. Yet when unrolled and locked in position, the Aladdin's Roll-Up ladder becomes rigid and handles like a conventional ladder. According to the maker, the ladder will easily support 1,000 lb. in the ladder position, and it can be unrolled and locked in less than 30 seconds.

The ladder comes in two lengths: 12 and 16 ft. The 16-ft. ladder rolls up into a 20-in. diameter bundle and weighs about 24 lb. Source: **Aladdin's Products, Inc., 50 W. Broad, Columbus 15, Ohio.**

●

Gate valve

. . . of ductile iron now obtainable is claimed to offer several advantages over valves and other materials: three times the strength of gray cast iron, nearly as high a strength as carbon steel, and a lower cost than steel valves. The valve is made of nodular or spheroidal cast iron, a metal with a higher thermal shock resistance than ordinary gray cast iron. Corrosion resistance is reportedly equal to that of gray cast iron, and impact strength is higher.

The valve comes in 2 through 12-in. sizes and is recommended by the maker for oil services at temperatures from −20° to 650° F. Source: **Crane Co., 836 S. Michigan Ave., Chicago 5, Ill.**

SHOWCASE . . .

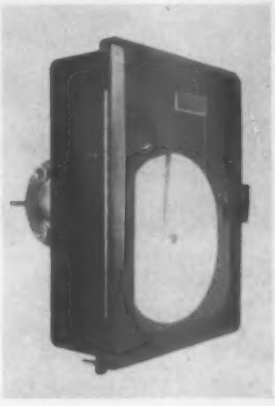
New Equipment

Compact trencher

. . . self-propelled, now being sold cuts trenches 3 to 6 in. wide and 5 ft. deep at speeds up to 500 ft. an hour, the maker claims. Powered by a 9-hp. engine, the trencher uses four-wheel drive in both forward and reverse. The digging boom is lifted hydraulically through an arc of 186°.

The trencher can be towed by a vehicle as it is equipped with wheels that are raised and lowered hydraulically and with a retractable drawbar. Source: **Auburn Machine Works, Auburn, Neb.**

●



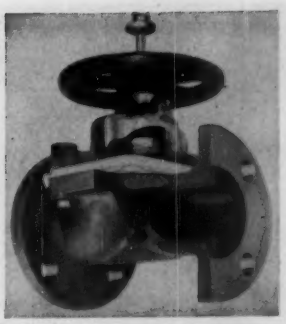
Recorder-controller

. . . a differential pressure type, is designed for measurement, recording, and control of fluids in oil production and gas transmission as well as for general recording and control applications. According to the maker, the Model 259 instrument combines the best features of the maker's recorder case, Model 199 ruptureproof meter body, and a U. S. Gauge pressure pilot. The instrument is claimed to be dependable and flexible. Source: **Barton Instrument Corp., 580 Monterey Pass Rd., Monterey Park, Calif.**

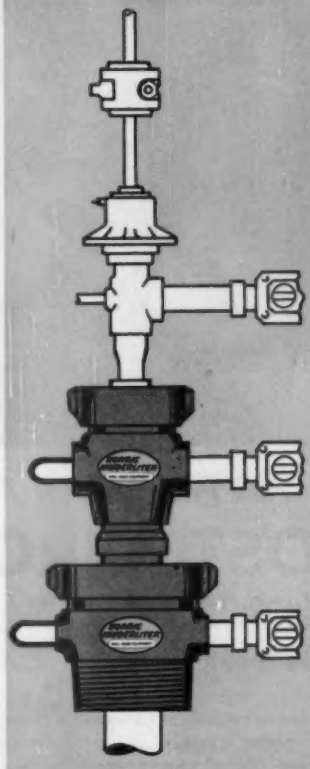
New 8-in. diaphragm valve

. . . offers flanged ends and a Penton lining to provide corrosion resistance to a wide range of chemicals. The lining is a chlorinated polyther.

The valve is said to be suited for maximum pressure of 100 psi. and temperatures to 240° F. The resilient diaphragm is said to isolate working parts from the line media and to seat tightly even against solid particles in the fluid flow. Source: **Hills-McCanna Co., 4600 W. Touhy Ave., Chicago 46, Ill.**



Engineered Simplicity



NORRIS
HINDERLITER
WELL HEAD
EQUIPMENT

Write for Well Head Equipment Bulletin for complete information.

W. C. NORRIS, MANUFACTURER
DIVISION OF DOVER CORPORATION
P. O. BOX 1739 • TULSA, OKLAHOMA
BRANCHES: Great Bend, Kansas; Corpus Christi, Houston, Kilgore, Odessa, Wichita Falls, Texas; Oklahoma City, Oklahoma; Salem, Illinois; Casper, Wyoming; Farmington, New Mexico; Edmonton, Alberta, Canada.

NORRIS HINDERLITER WELL HEAD EQUIPMENT

Buy From Your NORRIS Distributor

FOR PREVENTION AND CONTROL OF

LOST CIRCULATION

Call your local mud company or the Cherokee representative nearest you

CHEROKEE LABORATORIES, Inc.

HOME OFFICE — TULSA, OKLAHOMA • MANUFACTURING PLANT — LUFKIN, TEXAS

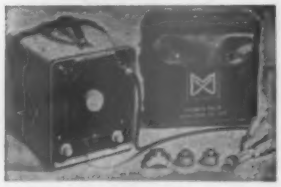
BRANCHES: CODY, CASPER; GRAND JUNCTION, HOBBS, OKLAHOMA CITY, MIDLAND, McALLEN, CORPUS CHRISTI, HOUSTON, DeQUINCY, LAFAYETTE, NEW ORLEANS.

TUF-PLUG IS LICENSED BY PAN AMERICAN PETROLEUM CORPORATION

Portable oil-fired heater

. . . now available offers a way to keep workers warm during the coming winter as well as a way to thaw machinery or warm long sections of pipe. It's offered in four sizes with ratings from 100,000 to 1,000,000 B.t.u. per hour. A built-in thermostat maintains desired temperature. Features include an electrically driven fan and an enclosed combustion chamber. Source: **Stow Mfg. Co., 484 Shear, Binghampton, N. Y.**

•

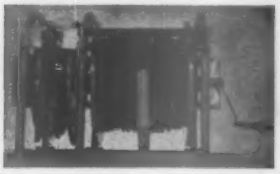


Wall thickness

. . . is easily measured with a new and completely transistorized battery-operated ultrasonic instrument now available, according to the maker. The SO-300 instrument measures wall thicknesses between 0.025 and 2.50 in. to an accuracy of 1% when calibration is checked during tests against a known sample of the same material, the maker says.

To use the instrument, place a transducer on the surface to be measured and turn a dial. The instrument weighs about 12½ lb. Source: **Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill.**

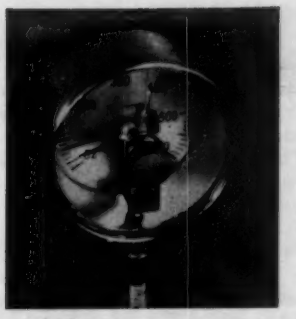
•



Two-in-one cable reel

. . . is now available equipped with one reel having a capacity for 50 ft. of 2/0 cable on a spring-operated drum, and with another reel with a capacity for 200 ft. of 2/0 cable on a hand-operated drum.

The Model EA-11 reel is said to make it possible to put the required amount of either cable into use quickly. Current rating of the unit is 300 amp., with 50% temporary overload factor. Both operating sections are isolated from each other and from the supporting framework. Source: **United Specialists, Inc., El Dorado, Ark.**



Magnet

. . . holds thermometer in place making a simple way to measure temperatures of tanks, pipes, and vessels and to determine heat loss across furnaces, steel walls, and other steel equipment. Thermometers for temperature measurement only, thermometers with a maximum reset hand, and thermometers with an electric contactor to permit on-off temperature control—these are the three thermometer styles available.

A bimetal type, the thermometer comes in ranges for temperatures from —60° to 700° F. Its accuracy is claimed to be better than 2%. Al-Ni-Co magnets hold the thermometer to steel and other ferrous objects. Source: **Industrial Service Co., 2 Richmond, Providence 3, R. I.**

MACCO

MACCO PARAFFIN SCRAPER—SUBSURFACE PLUNGER

(Lubricator and Plunger)

The Macco Paraffin Scraper is used primarily for removing paraffin deposits inside the tubing string. It has also proven highly successful for unloading sluggish gas wells, flowing wells which are produced by the "stop-cock" method, and as a plunger for lifting fluid in high ratio oil wells.

The lubricator and catch assembly is mounted on the wellhead with the plunger inside. The plunger is dropped through the tubing to a predetermined tubing stop.

The timing of this operation is regulated by a flow line controller, except on intermitting gas lift wells. When the well kicks, the plunger returns to the surface, removing paraffin deposits.

If your well falls under one or more of these basic type wells, check with your Macco representative for further information: or write for Paraffin Scraper Brochure No. 14-02.

- PARAFFIN PRODUCTION
- HIGH GAS-OIL RATIO WELLS
- GAS WELLS THAT LOG UP
- HIGH GRAVITY GAS LIFT WELLS
- STOP-COCK WORK ON LOW PRODUCTION WELLS
- EMULSIFIED FLUID PRODUCTION

MACCO equipment is also available in sterling areas from Williams & James (Oil Tools) Ltd., Gloucester, England.

MACCO OIL TOOL COMPANY, INC.

1521 Prince P. O. Box 7288 Houston 8, Texas Phone UN 1-1253

Easier computer programing

. . . is now possible with a new algebraic compiler that has been developed.

The ALGO compiler will allow anyone with a knowledge of high-school algebra to program engineering problems as they are being analyzed.

Presently it is available to users of the Bendix G-15 computer. Source: **Bendix Computer Div., Bendix Corp., 5630 Arbor Vitae, Los Angeles 45, Calif.**

Power converter

. . . is a multimotor type that reportedly permits operation of three-phase electrical equipment from single-phase lines with the exceptional feature that any number of three-phase motors can be operated through one conversion system.

Three-phase motors can be operated singly or simultaneously, the maker says. The multimotor Add-A-Phase converter will operate 220 or 440-volt, three-phase equipment from 220 single-phase lines, according to the maker.

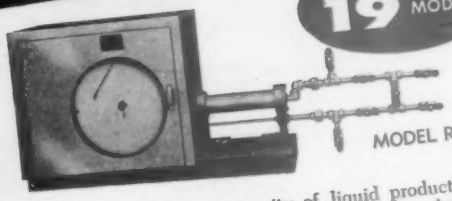
Multimotor transformer stations come in 1 to 80-hp. ratings. Source: **System Analyzer Corp., Nokomis, Ill.**

●

ARCCO

ARCCO ANUBIS
LIQUID GRAVITOMETER
FOR PIPELINES, REFINERIES, GASOLINE PLANTS

NOW 19 MODELS



Wherever the specific gravity of liquid products or processing fluids is an important factor Arcco-Anubis Liquid Gravitometers will render accurate recordings of continuous flow and spot checks of samples under varying conditions of temperature and pressure. Foreign liquids and gases are automatically purged. Changes in the specific gravity of the sample are recorded almost instantly. High pressure and high viscosity liquids are handled with ease. Charts graduated for specific gravity are available in over 100 ranges. Charts for Degrees A.P.I. are available in over 30 different ranges. Arcco Liquid Gravitometers are made for recording, controlling, indicating, transmitting and various combinations of these functions. Special charts when required can be furnished at slight additional cost.

ARCCO Send For Bulletin No. 111-R4
INSTRUMENT COMPANY, INC.
7144 EAST CONDOR STREET · LOS ANGELES 22, CALIF.
MANUFACTURERS OF PRECISION INSTRUMENTS

Send For Bulletin No. 111-R4

Single-phase motor

. . . is totally enclosed, fan cooled, and available in ratings of 1 to 5 hp. The motor has internal fans cast integrally with the rotor to recirculate internal air and prevent hot spots. Additionally, an external fan forces air over fins cast integrally with the frame to carry away heat. A hood protects the external fan.

The maker claims no dust or moisture can enter the motor. Two plugged openings in the motor permit drainage of condensate. Source: **Brook Motor Corp., 3302 W. Peterson Ave., Chicago 45, Ill.**

●

Relief valve

. . . for 4,000 psi. now available is constructed of heat-treated aluminum bar stock with bronze and monel trim and comes in two sizes: ½ and ¾ in. It can be used to supply a process or piece of equipment requiring a small capacity or a small unit under test. The maker says it controls pressures within as little as 2 to 3 psi. over the adjustable range.

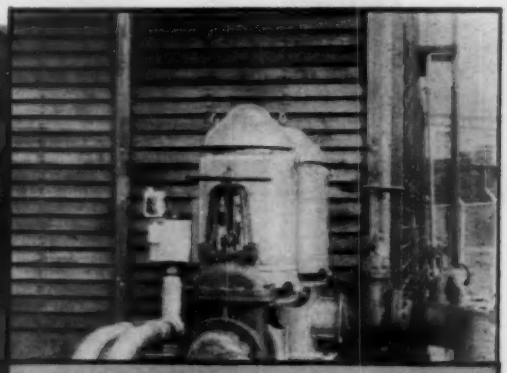
The 3851 Type F valve is a single-seated, spring-loaded, diaphragm-actuated type with adjustable pressure ranges of 0 to 1,000, 0 to 2,000, and 0 to 3,000 psi. Source: **Atlas Valve Co., 280 South St., Newark 5, N. J.**

FLOWAY
formerly SMITHway

VERTICAL TURBINE PUMPS

Know how much WATER this takes?

Here is a critical cooling job.
Oceans of water must be pumped
to absorb the enormous heat
generated at blast-off.
By comparison the usual industrial
cooling job seems relatively easy,
yet no matter what its purpose,
cooling is always vital.
You need good pumps . . .
pumps that are engineered
and built to do the job.
FloWay pumps are working effectively
in cooling installations throughout the world.
Mail coupon for bulletin describing
FloWay pumps for every industrial need.



FLOWAY PUMPS

Manufactured by
Fiese & Firstenberger Mfg., Inc
2494 Railroad Ave Fresno, Calif.

Contact your FloWay distributor

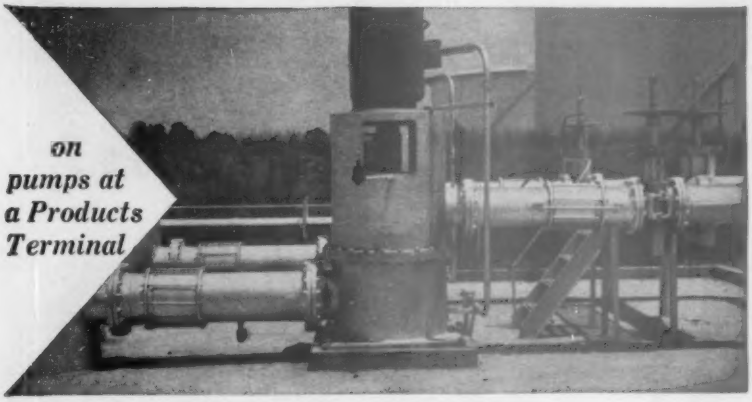
Oakland, California
Pacific Pumping Company
San Francisco, California
Woodin & Little
Denver, Colorado
Harry J. Glass & Associates
Oakland Park, Florida
Peninsular Armature Works
Metarie, Louisiana
A. G. Kirkwood Co.
Baltimore, Maryland
E. Thum & Company
Buffalo, New York
Ralph Simmons & Company
New York, New York
Frank A. Kristal
Cleveland, Ohio
W. J. Bryson Company
Tulsa, Oklahoma
The Kase Company
Portland, Oregon
Pacific Pumping Company
Ardmore, Pennsylvania
Warren E. Quillman
Pittsburgh, Pennsylvania
Weinman Pump & Supply Co.
Dallas, Texas
Livingston Machinery Co.
Houston, Texas
Pump & Power Engineering Co.
Seattle, Washington
Pacific Pumping Company
Detroit, Mich.
Detroit Air Compressor

Fiese & Firstenberger Mfg., Inc.
2494 Railroad Ave. Fresno, Calif.
Gentlemen:
Please send at once FloWay Bulletin #14

Name.....
Address.....
City.....State.....

**For Full Information
Clip and Mail Today**

Dresser® Couplings—



on pumps at a Products Terminal

easy, bottle-tight...

on filters and pump lines

safe, permanent joints!

Dresser Couplings are easily installed and bottle-tight for life! The specially compounded Dresser Gasket provides rugged "give and take" to absorb vibration, settlement and other stresses that might cause damage. And there's no pipe threading. With plain end pipe, any workman can install Dresser Couplings in an average two man-minutes per bolt *using only a wrench.* And even with pipe deflection up to 4°, you still get a perfect Dresser-Coupled joint. Send for Dresser Catalog No. 531; it contains more detailed information and complete specifications on *all* Dresser Couplings, Fittings and Pipe Repair Products.

• GET THEM FROM YOUR LOCAL OIL FIELD SUPPLY STORE

Bradford Pennsylvania

Chicago
Houston
New York
S. San Francisco
Toronto & Calgary

DRESSER
MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES

The NEW GEODRIL® AUTOMATIC DRILLER

gives you

1. LONGER BIT LIFE
2. FEWER TRIPS
3. STRAIGHTER HOLE

The GEODRIL Automatic Drilling Control was developed, tested and proved in the field by The Geograph Company, manufacturers of the internationally accepted Geograph Mechanical Well Logging Recorder.

The new, automatic GEODRIL control has many outstanding features and offers the drilling contractor dependability, economy and safety.

Service for the GEODRIL Control is provided by the experienced personnel of Geograph Oil Field Services. Their reputation for service is backed by over a fifth-of-a-century of experience in the oil fields.

When you drill your next well, specify the NEW GEODRIL Automatic Driller for maximum drilling efficiency. For additional information, contact your nearby Geograph Oil Field Services office.

GEODRIL® AUTOMATIC DRILLER

GEOLOGRAPH®
OIL FIELD SERVICES
P. O. Box 1776 • Oklahoma City 1, Okla.

SHOWCASE . . .

New Literature

Bronze valve

. . . catalog offers screw-end or sweat-end gate valves with O-ring or conventional packing, renewable disk conventional brass-seat screw-end globe valves, screw-end or copper-to-copper compression stops and valves, and a wide variety of gas cocks, check valves, radiator valves, circulator valves, and balancing elbows. Eight-page Catalog 60 includes dimension charts, diagrams, and roughing-in data providing details for layout planning and fixture specifying and ordering. Source: **American Valve Mfg. Co., 22 Bayview Ave., Manhasset, L. I., N. Y.**

Slide gates

. . . for attachment to existing duct work, hoppers, screw conveyors, bucket elevators, or other process machinery to control or shut off flow of bulk materials, are described in a new available literature piece. A photograph illustrates an air-operated slide gate complete with air cylinder and needle valve. Source: **Bucket Elevator Co., Summit, N. J.**

Lightweight castable insulation

. . . called Franco-Lite cast block mix, for backing up industrial-furnace linings, is discussed in two-page Bulletin 216. In addition to features of the mixes, the bulletin includes data on linear change, cold crushing strength, and bulk density. Thermal-conductivity factors are shown in table and graph form, including mean temperatures from 250° to 1,650° F. Two seperate tables show cold-face temperatures and B.t.u. loss per square foot at temperatures from 150° to 1,600° F., and at insulation thicknesses ranging from 1 to 6 in. Source: **J. H. France Refractories Co., 5180 France Road, Snow Shoe, Pa.**

Booklet details Nitroneal generator

. . . which catalytically reacts air and ammonia over a platinum catalyst to produce oxygen-free nitrogen gas with a controllable hydrogen content of from 0.5 to 25%. According to the literature, no carbon compounds, sulfur compounds, or oxides of nitrogen are formed by the catalytic reaction and the gas generated contains less than 1 p.p.m. of oxygen. Nitroneal generators are used in chemical and petroleum industries for inert atmospheres to prevent oxidation in blanketing, purging, and packaging operations. Source: **Engelhard Industries, Inc., 75 Austin St., Newark 2, N. J.**

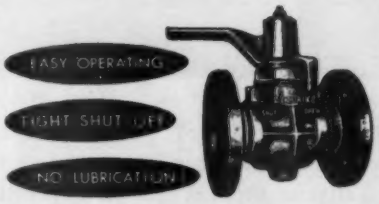
Three-in-one mast

. . . and substructure trailer assembly, called the Crusader, is featured in a four page bulletin available free for the asking. Designed for drilling,

Corrosion Problems?

Do you need an Iron Valve? A Bronze Valve? A Ni-Resist Valve? An Aluminum Valve? A Carbon Steel Valve? A Ductile Iron Valve? A Stainless Steel Valve? An Alloy 20 Valve? A Monel Valve? A Nickel Valve? A Hastelloy B Valve? A Hastelloy C Valve? A Plastic-Coated Valve? A Rubber-Lined Valve?

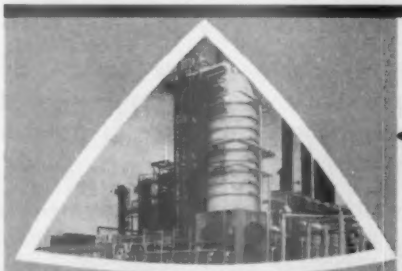
DeZurik's Got it!



In sizes from ½" thru 24", with a complete line of actuators for remote and automatic operation. Write for details, or see the DeZurik representative in your area.

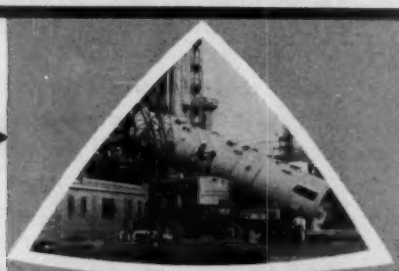
DeZURIK CORPORATION
SARTELL, MINNESOTA

Hastelloy Reg. T.M. of Haynes Stellite Co.

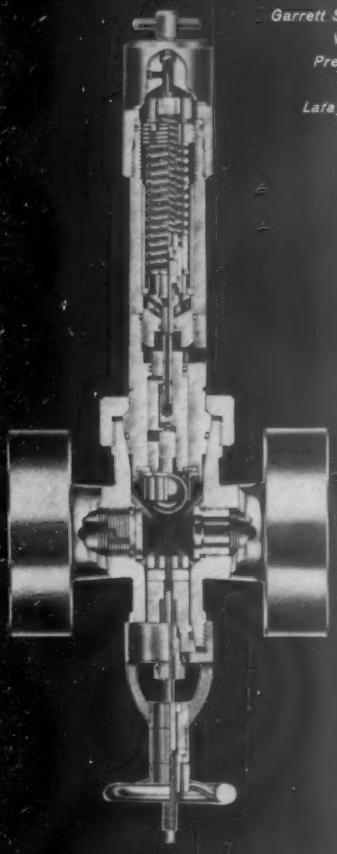


SMALL PLANT design, engineering and construction is a specialty. Turnkey, guaranteed maximum or cost plus fixed fee agreements are offered.

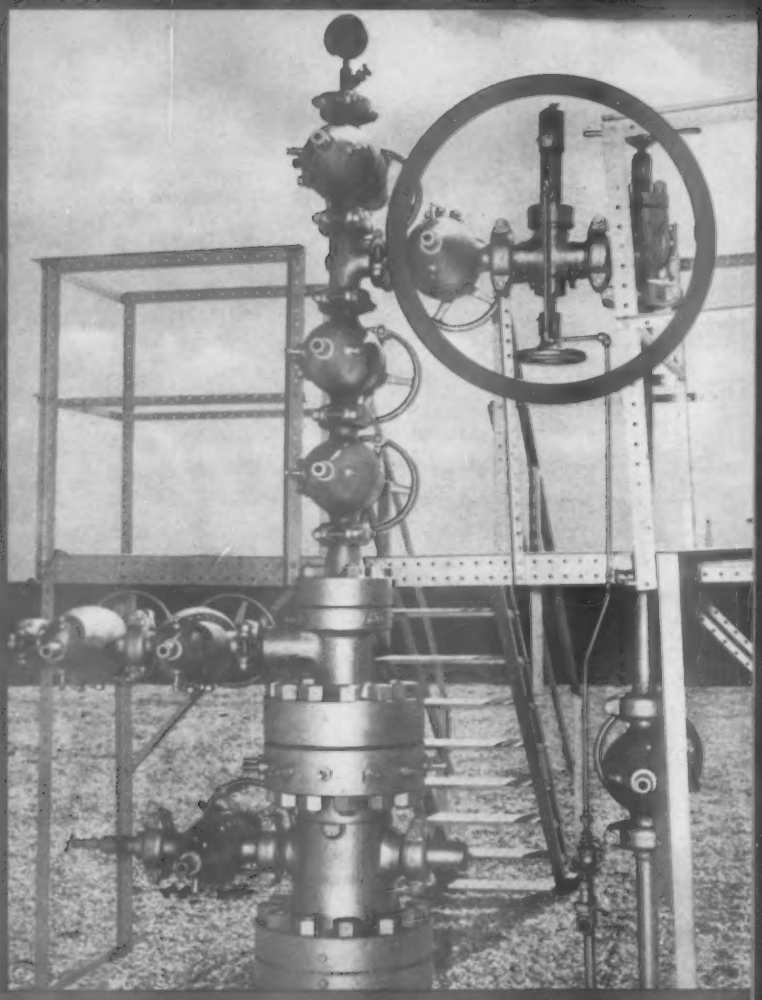
Litwin ENGINEERING COMPANY
204 N. WACO / WICHITA, KANSAS / CABLE: LITWIN
Representatives in EUROPE, MIDDLE EAST, and SOUTH AMERICA



ECONOMIC STUDIES to help you with the application of new processes for future expansion or revamps. Write for our brochure L-1 at no obligation.



Garrett Safomatic Valve
World's Highest
Pressure Gas Well
13,000# Shut-in
Lafayette, Louisiana



GARRETT SAFOMATIC SELECTED FOR WORLD'S HIGHEST PRESSURE WELL

Another GARRETT-ENGINEERED product

Union Texas Natural Gas Corporation's #1 Adams in South Louisiana recorded a seam straining 13,000 psi shut-in wellhead pressure. Yet, down stream lines and equipment are as safe as if they were connected to a non-flowing well.

Positive pressure control is provided by a Garrett Safomatic Valve mounted right on the tree. Should pressure exceed the preset maximum or fall below the minimum range . . . the well would be shut-in automatically. Closure is instantaneous and as positive as if the master valve were closed.

Safomatic valves can be installed on any line or equipment that needs protection. Many are used on gathering lines, heaters, treaters and other equipment. Three basic Garrett designs handle a range of pressures up to 15,000 psi.

Standard Safomatic valves operate automatically from line pressure changes. Remote operated Safomatic valves may be actuated by pressure conditions at another point in the system.

Check with your Garrett representative on the extra safety possible with a Garrett Safomatic installation.

USI **Garrett Oil Tools**

DIVISION OF U. S. INDUSTRIES, INC.
P. O. BOX 2427, LONGVIEW, TEXAS

workover, or servicing, it's available in either 86 or 96-ft. heights. Source: **Fox Equipment & Derrick Co., 4712 Selkirk, Fort Worth.**

New centrifugal pump

. . . with canned stator and flow-through-type rotor impeller is detailed in available four-page Bulletin M-60. It tells how the Magnaflow pump works when mounted in any position in a pipeline and gives complete specifications. The literature piece also includes a schematic diagram showing liquid flow through the rotor and an exploded view showing pump parts. Source: **Corley Co., Inc., 685 Myrtle Ave., Boonton, N. J.**

Ductile-iron valves

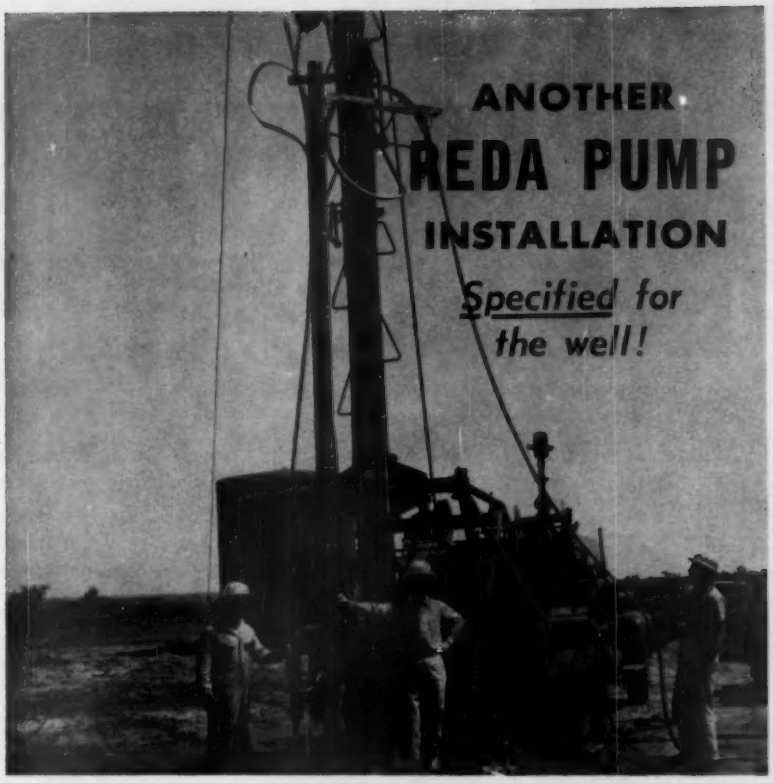
. . . bulletin claims that gate valves of this material are the optimum selection for services where cast iron will not meet operating requirements, yet where steel with its higher cost is not justified. Recommended for sour crude, finished oil products, and refinery applications, the gate valves are available in sizes from 2 through 12 in. Source: **Crane Co., 4100 S. Kendzie Ave., Chicago 32.**

Paint for chain-link fences

. . . when applied directly on rust, stops rust action and provides complete one-coat protection, as related in an available four-page bulletin. The literature also gives details about such related products as: (1) No-Glare coating for window glass; (2) aluminum-roof coating which reduces summer heat; (3) heat-resisting aluminum and black paints; (4) acid and alkali-resisting paints which provide washable surfaces in corrosive areas; (5) a new all-purpose paint; (6) an enamel which gives a corrosion and abrasion resistant covering for floors; and (7) glass-cleaning crystals for cleaning of factory windows and skylights. Source: **Skybryte Co., 3125 Perkins Ave., Cleveland 14.**

Clamp-couplings

. . .brochure gives information on repairing pipe of different kinds and coupling machined ends of asbestos-cement pipe with band-type split repair clamp couplings. The four-page brochure describes clamps for pipe sizes through 24-in., and includes techniques for repairing larger concrete and wooden pipe. Source: **Smith-Blair, Inc., 535 Railroad Ave., South San Francisco.**



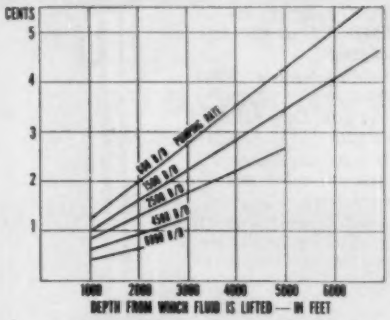
REDA Does the Job Better and at LOWER COST

Billions of barrels of fluid (oil and water) have been produced at an average lifting cost of less than one cent per barrel for each 1,000 foot lift. Chart "A" illustrates average lifting cost from 600 B/D to 6,000 B/D using Reda Submergible Pumps.

Most complete submergible pump line for producing oil wells, water supply wells, brine wells, etc. Sizes range from 5 to over 240 h.p. . . . models for wells cased with 4", 5½", 6⅝", 7" or 9⅝" casing . . . for depths from 500 to 10,000 feet, and for capacities of 100 bbl. to over 18,000 bbl. per day.

Visit us at Permian Basin Oil Show
Oct. 20-23, Odessa, Texas
Booth B-13

AVERAGE LIFTING COST* per barrel of fluid



*Included: Electric Energy (10 Mills Per KWH), Run and Pull, Repairs, Upkeep, Transportation, Labor and Amortization (8 Yrs.)

Chart "A"

Write for Descriptive Folder R-686 Today

REDA PUMP COMPANY / BARTLESVILLE, OKLAHOMA

Manufacturers of Submergible Electric Motors & Pumps for over 40 years
Pumps for Oil, Brine, Water, Gasoline, Jet Fuel, Chemicals, LPG

SIGN OF QUALITY
SUBMERGIBLE
REDA
PUMPS

You, too, can get dehydration at a profit . . .

DRY FRAC CONVERTS "EXPENSES" into PROFITS!

To most gas producers, the cost of dehydration is a necessary expense that is required to bring sales gas to pipeline specifications. There are many instances; however, where DRY FRAC can actually convert this expense into profits through initial or increased recovery of valuable hydrocarbons.

Here are four general situations where DRY FRAC can be used economically:

1. Where sufficient pressure drop is not available to operate conventional low temperature separation.
2. Downstream from conventional low temperature separation equipment where enough recoverable heavy fractions are still in the dehydrated gas to justify a DRY FRAC unit.
3. Where gas stream is too lean in heavy hydrocarbons to be processed economically by other means.
4. For dewpoint control where pipeline companies specify maximum hydrocarbon dewpoint as well as maximum water content.

Take another look at your gas production. You may not be realizing your full profit potential. With DRY FRAC you get dehydration to pipeline specification PLUS hydrocarbon recovery in one operation!

BS&B will give you accurate evaluation of wellstream potential and recommend the proper type and size of unit for maximum delivery and a quick payout!

4-TOWER CLOSED SYSTEM

Plant capacity: 50 MMSCFD at 600 to 800 psig.
Design pressure: 1000 psig.
Inlet gas: C_5+ GPM of 0.240.
No inlet separator required; inlet gas is liquid free.
Closed cycle regeneration but also equipped for open cycle operation.

3-TOWER OPEN SYSTEM

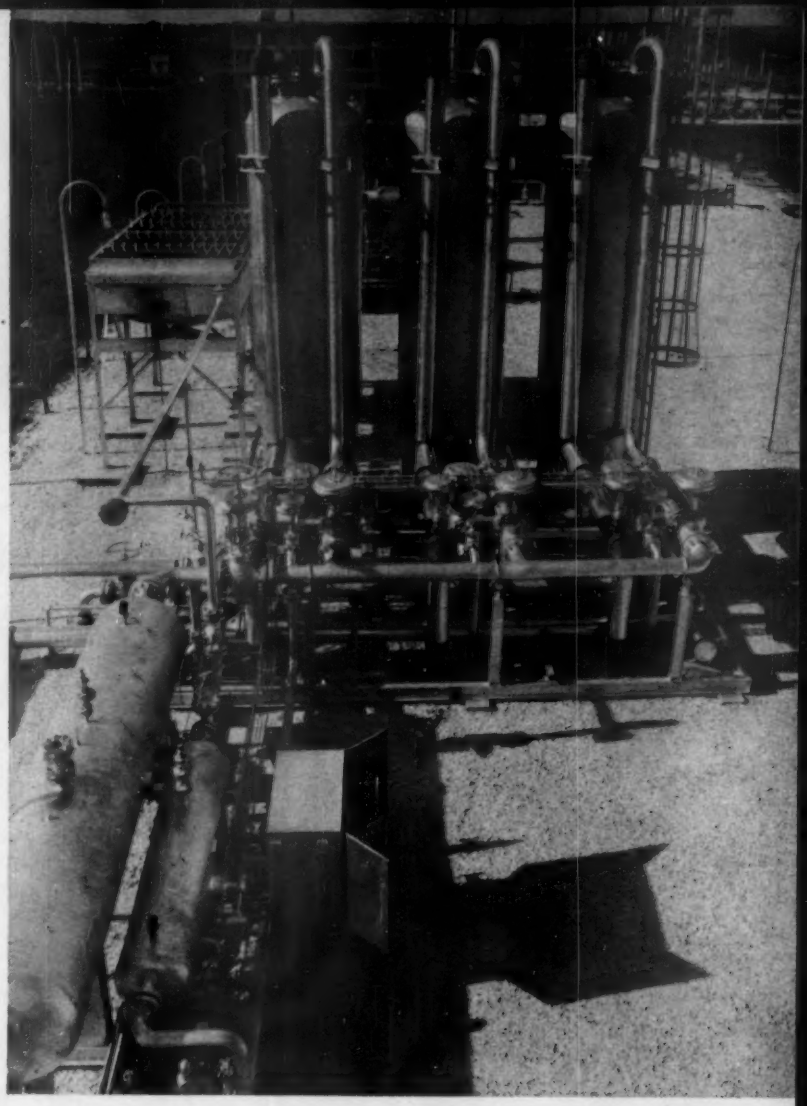
Plant capacity: 62 MMSCFD at 900 psig.
Design pressure: 1200 psig.
Inlet gas: C_5+ GPM of 0.067.
Open Cycle regeneration.

BASIC PROCESS OF DRY FRAC

DRY FRAC makes use of two or more dry desiccant beds to adsorb desired components from gas stream. When one bed becomes saturated, gas stream is switched through another bed. Saturated bed is then regenerated by passing heated gas through it to vaporize and drive off components which have been adsorbed on the desiccant. These components are condensed in heat exchange coolers and recovered from the regeneration gas stream.

Two types of regeneration systems may be used. In the "open" system, a side stream of gas from the main gas stream is forced through regeneration system to rejoin main stream ahead of inlet to the adsorbers. In the "closed" system, a trapped volume of gas is continuously recirculated through regeneration cycle by a blower.

DRY FRAC is basically similar to dry desiccant dehydrators except that drying and regeneration cycles have been shortened to utilize a greater weight of desiccant per unit volume of gas processed, while reducing size of adsorbers and total amount of desiccant required.

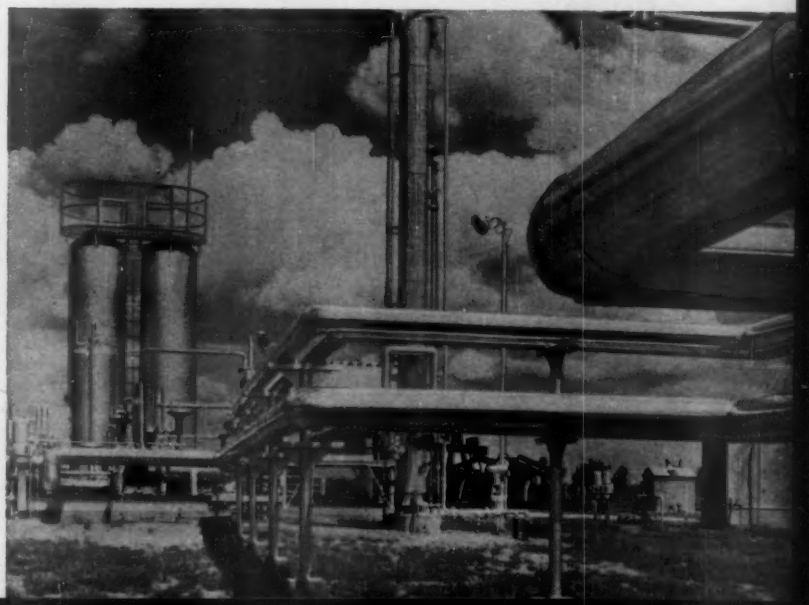


BS&B — EFFICIENCY — RELIABILITY — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

Dept. 1-A10A P. O. Box 1714, Oklahoma City

DRY FRAC is backed by BS&B's many years of engineering experience in all types of hydrocarbon recovery processes.



2-TOWER CLOSED SYSTEM

Plant capacity: 6.7 MMSCFD at 1000 psig.
Design pressure: 1200 psig.
Inlet gas: C_5+ GPM of 0.739, part of which is separated in inlet separator.
Closed cycle regeneration but also equipped for open cycle operation.

▶▶▶ Equipment Men Notes

W. F. Roberts is sales engineer

W. F. Roberts

. . . for Western Supply Co.'s Heat Exchanger Division, announces J. E. Hughes, vice president of the Tulsa firm. A veteran of 13 years in the chemical and heat-transfer field, Roberts will cover the Mid-Continent area and will contact refineries, chemical and petrochemical plants within the area. Prior to joining Western, Roberts was Oklahoma district representative for Yuba Consolidated Industries.

National Supply Co. moves

. . . its Illinois district office to Evansville, Ind. Formerly the company had its district office at Olney, Ill., and operated a sales office in Evansville. Robert T. Harris is district manager of the office and Charles C. Moats is his assistant.

Bowen Itco, Inc., announces

. . . a new location for its export sales office in New York City. The office, under the direction of Louis P. Siracusa, eastern division sales manager, will be located in the General Dynamics Building, 1 Rockefeller Plaza.

W-K-M transfers district office

. . . from Shreveport to Dallas, according to Glen Tableman, sales manager for the division of ACF Industries, Inc. William E. Giffhorn, manager of the Mid-Continent district, has also been transferred to Dallas.

Charles R. Shumate, who handled the sales of W-K-M products in the Dallas-Fort Worth area, has been appointed sales representative for the company's international district. He will locate at the home office in Houston.

Oil Well Supply Div. appoints

. . . Earl L. Bundy as area manager—production equipment sales at Evansville, Ind., and W. E. Willis as district engineer at Clay City, Ill., reports J. P. O'Toole, eastern area manager of the division.

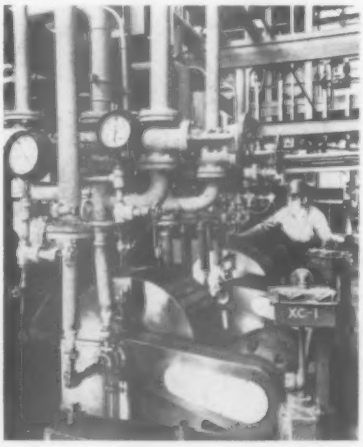
Bundy was employed by Oilwell in 1946 at Olney, Ill. He was transferred to Oil City, Pa. in 1948 and back to Olney the following year as assistant district engineer. He became district engineer — machinery and equipment sales and service at Olney in 1952.

Willis started with the division 8 years ago at Carmi, Ill. as a junior engineer. He was appointed field representative there in 1953 and was transferred to Olney in 1954. During this assignment he was appointed assistant district engineer.

PLANT AND OFFICES of Oil Equipment Mfg. Co., in Louisville, have been enlarged and modernized. A large extension was added to the manufacturing, storage, and shipping departments, and offices, drafting, and engineering departments are now housed in the building. The Kentucky firm manufactures balanced loading assemblies.

Dresser Industries acquires

. . . Podbielniak, Inc., Chicago-based manufacturer of centrifugal countercurrent solvent extractors shown here in a refining installation. These liquid-liquid contactors and clarifiers are used for: phenol and furfural refining of lube and gas oils; separation of monomer and polymer by solvent extraction; purification of tricresylphosphate and other gasoline additives; acid treating, caustic neutralization and water washing of lube oils; extraction and purification of oil soluble sulfonates.



As an integrated part of Dresser, Podbielniak will continue to expand its line of equipment including laboratory fractional distillation apparatus. The firm will utilize Dresser's world-wide sales organization.

Name change is announced

. . . by Thompson-Ramo-Wooldridge Products Co. Now called TRW Computers Co., the organization will continue to function as a computer division of Thompson Ramo Wooldridge, Inc. Headquarters remain in Beverly Hills, Calif.

Liberty Mfg. Co. of Texas elects

J. H. James

. . . John H. James to the office of president and W. R. Pardue to secretary-treasurer. James joined Liberty in 1951 and was secretary-treasurer prior to this promotion. He replaced W. A. E. Woods as company president.

Ray W. Thompson is appointed

. . . to general sales manager of Square D Co.'s Marketing Division, according to M. P. Kartalia, vice president of marketing. In his new capacity Thompson will spend most of his time in field contact, acting as liaison between headquarters and Square D's sales regions. He will operate from the company's new corporate headquarters in Park Ridge, Ill.

Concurrent with Thompson's appointment, Kurt Morris was named midwestern region manager. Formerly merchandise sales manager in charge of Square D regional warehouses, Morris will locate in offices at the Schiller Park, Ill., plant. William J. Moriarity will assume Morris' warehouse responsibilities while continuing in his present position as manager of distributor relations.

Charles F. Ebsen becomes

. . . general manager of Foster Wheeler Corp., announces John E. Kenney, president of the New York builder of oil refineries, process

EL TORO 35

OIL WELL CEMENT

35

Southwestern Portland Cement Company

EL TORO

SOUTHWESTERN PORTLAND CEMENT COMPANY • EL TORO BRAND

Engineering data available on request.

EL TORO 35

SOUTHWESTERN PORTLAND CEMENT COMPANY

P.O. BOX 1547, ODESSA, TEXAS • FEderal 2-0221

plants, and steam powerplant equipment. Ebsen, former manager of process plants sales, has served in varied sales capacities for the past 11 years.

Robert J. Koch takes over

. . . as southwest regional sales manager of Morse Chain Co., according to J. V. Moynes, vice president and general sales manager of the Ithaca, N. Y., firm. With headquarters at Houston, Koch's territory will include Texas, Louisiana, Mississippi, Oklahoma, and southern New Mexico.

Koch has been a member of the Morse staff for 30 years. After spending some years in Houston, he went to Morse headquarters in Ithaca in 1955 for 5 years of sales-administration work.

NEW FACTORY and main offices have been opened in Tulsa by Warner Lewis Co., division of Fram Corp. The structure contains 77,000 sq. ft. of floor space in a layout that includes room for increased manufacturing facilities. The company's personnel in Tulsa totals about 200.

Forrest H. Ramage becomes

. . . sales manager for Republic Steel Corp.'s Pipe Division, announces Norman W. Foy, vice president in charge of sales. Ramage succeeds J. W. Owings. The newly appointed sales manager has been employed by Republic and a predecessor company since 1926 and has served as assistant manager of pipe sales since 1945.

Detectogas Instruments names

. . . Frank A. Paul as a sales representative for the Detectogas monitor, a gas safety device. He will work out of the Houston office. Paul formerly was a sales engineer for J. R. Dowdell & Co. and Chapman Valve Mfg. Co.

Rolo Mfg. Co. appoints pair

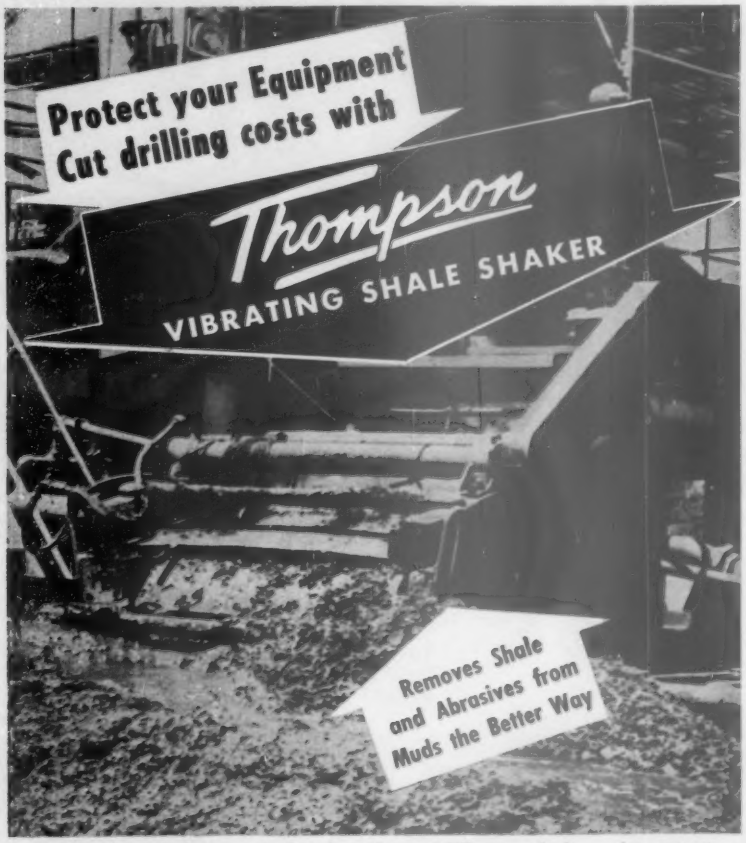
. . . to executive posts within the company, announces Robert K. Franklin, president of the Houston manufacturer. Walter Henry has been promoted to assistant general manager and elected to the board of directors. Ross B. Baze has joined the firm to serve as vice president in charge of sales.

Walter Henry

R. B. Baze

Henry formerly held the post of vice president in charge of manufacturing. He has been with Rolo since 1956, serving as plant manager before being named vice president.

Before joining Rolo, Baze served as vice president and director of Delta Tank Mfg. Co. in Baton Rouge, La. A veteran of almost 20 years in the oil-field-equipment industry, he previously was with Black, Sivalls & Bryson, Inc.


Protect your Equipment
Cut drilling costs with
Thompson
VIBRATING SHALE SHAKER
Removes Shale and Abrasives from Muds the Better Way

Separation of shale and abrasives from drilling muds is an important *must* for an effective, time-conserving, money-saving drilling job. Reclamation of mud is vitally important. No matter what the mud flow or well depth may be, a THOMPSON Vibrating Shale Separator and Sample Machine stands up to meet any demand. It's field proven! *You get clean mud.* THOMPSON Separators are self-motivated . . . making tools last longer . . . with a minimum of re-tooling and restoration of mud solution.

A THOMPSON Separator is your surest bet . . for shallow, medium and deep wells. The dependable Sample Machine works simultaneously with the Separator, giving a foot-by-foot mud analysis with specimens. *Write for Free Folder.*

THOMPSON TOOL CO.
IOWA PARK, TEXAS

SOLD ONLY THROUGH SUPPLY STORES

J. A. Tucker assumes position

J. A. Tucker

. . . as chief engineer—LACT and processing equipment for Jones & Laughlin Supply Division, according to W. L. Wolfe, vice president—sales.

Jones & Laughlin recently was appointed distributor of Major Engineering Co.'s meter ACT units. Tucker will administer the sale of these units as well as tanks and related lease-processing equipment.

Tucker joined J&L as a salesman at Houston in 1947. He was transferred to Cleveland in 1952, and a year later was appointed chief engineer—refinery products at the Tulsa headquarters. He became chief sales engineer—projects in 1955.

Motorola promotes 3 members

R. G. Jones

. . . of its microwave sales organization, according to Irving Koss, manager of the Chicago firm's microwave department. Richard G. Jones has been named manager of microwave marketing, headquartering in Chicago. He will act as national manager of commercial microwave sales and will supervise all microwave marketing activities.

Succeeding Jones as microwave sales manager for 11 western states with headquarters in Burlingame, Calif., is Delbert G. Larson, former microwave sales representative in the Pacific Northwest. Larson has been with the company since 1951 and has been associated with microwave operations since 1954.

Also added to the Burlingame staff is Robert L. Koehler in the newly created post of western district microwave specialist. In his new job he will coordinate the sale of microwave equipment to various industrial, government, and commercial organizations. Koehler previously was microwave sales representative in the Arizona-Utah-Nevada area. He has been with Motorola since 1957.

Crest Instruments signs

. . . an exclusive agreement with Pure Oil Co. to manufacture and sell corrosion measuring equipment under Pure's patents. Crest, headquartered at Santa Fe Springs, Calif., is a division of Magna Products.

For Constant, Uninterrupted

POWER FLOW in the OIL FIELDS

You'll Never Go Wrong with

FIELDMASTER

BALL BEARING MOTORS

Here's Why . . .

They are specifically designed to overcome the unusual conditions of Oil Field requirements, and there is a type and H.P. built to fit your exact needs. Unexcelled since they are . . .

- **DRIP PROOF**
- **VERMIN PROOF**
- **MOISTURE PROOF**
- **CORROSION RESISTANT**
- **FORCED AIR COOLED**
- **HAVE SEALED TERMINAL PORT**

SEMI-ENCLOSED — normal or medium slip, 3 phase, 60 cycle. Has prelubricated ball bearings in semi-enclosed protected housing, 40 degree C rise. Built for continuous duty. **High Torque, low starting** current. Extra insulating coating throughout.

TOTALLY ENCLOSED — Fan cooled, normal or medium slip, 3 phase, 60 cycle. Has prelubricated ball bearings, totally enclosed FAN cooled 55 degrees C rise, for continuous duty. High Torque — low starting current. Extra insulating coating throughout.

Write for fully descriptive literature

BETHLEHEM STEEL CO. Supply Division **Tulsa, Oklahoma**

Manufactured by Valley Electric Corporation, St. Louis 8, Mo.

the most compact purifiers give the most compact costs

Scrubbing gas with compact Hi-eF Purifiers saves money three ways. First, these units cost less than large tank type units of equal efficiency. Second, these easy-to-handle units save on space and installation costs. Third, by eliminating filtering, screening and moving parts, maintenance is virtually non-existent!

SPECIFICATION MANUAL 601 contains data on seven types of purifiers, separators, mist extractors, scrubbers. Write.

THE V. D. ANDERSON CO. 1977 West 96th Street, Cleveland 2, Ohio

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION

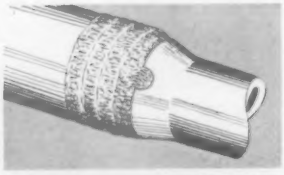
Why you should specify

AMERICAN IRON

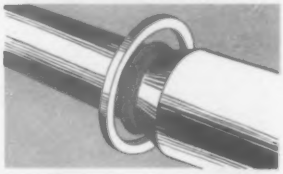
Flash Welded TOOL JOINTS

on your next string of drill pipe!

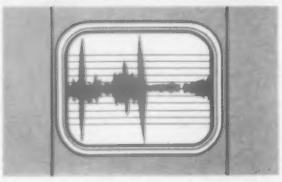
Here are three of the many reasons why you buy QUALITY when you specify AMERICAN IRON.



1. TUNGSTEN CARBIDE Hard Metal Bands are available on all American Iron Tool Joints. They are applied PRIOR to heat treatment which eliminates chipping, rapid wear and does not affect the physical metallurgy of the tool joint.



2. The "WEDDING BAND": a heat treating process used by AMERICAN IRON, which more than *doubles* the tensile-impact strength of the Flash Welded connection.



3. The REFLECTOSCOPE is a new electronic testing apparatus used by AMERICAN IRON for inspecting the weld zone for inclusions and defects. This assures you of *maximum performance* from your string of Flash Welded Tool Joints.

Specify Flash Welded OPEN-HOLE Tool Joints for your Lightweight Drill Pipe.

AMERICAN IRON

Another AMF Product PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

AMERICAN IRON & MACHINE WORKS CO. INC. OKLAHOMA CITY

THIS MOBILE EXHIBIT is being used by Dowell to train its field engineers on latest techniques and products.

Trailer keeps firm's employes up to date

• Touring trailer helps Dowell keep its employes acquainted with latest developments.

A TRAILER, featuring numerous displays of Dowell's oil-field chemicals and services, is making an extensive tour to all the firm's districts and stations in the oil-producing areas of the United States and Canada.

Accompanying the mobile unit will be a laboratory-research engineer and a technical-service and development engineer. These men will conduct a series of technical sessions for Dowell personnel in each area. The meetings include discussions and demonstrations of recent developments in oil-field chemicals and treating techniques.

The traveling exhibit was put on the road to bring company personnel up to date on new services and also provide for an interchange of technical ideas applicable to one field area that may be useful in another oil-producing province.

Exhibits included in the trailer are samples of the firm's different chemicals and cementing materials. Various types of propping agents used during formation - fracturing treatment are also on display along with models of models of Abrasijet tools and Baker Oil Tools, Inc., packers, examples of sundry portable field testing kits, and a complete miniature laboratory used for demonstrating fluid-loss additives. In addition are paraffin solvents and inhibitors, and various oil-field surfactants and demulsifying agents. Another feature of the trailer is that it is fully equipped to run complete analyses on formation cores, cuttings, or brine samples.

Dowell strongly feels that keeping employes up to date on the latest technical developments is a definite problem because of constantly changing technology of oil-field servicing. New chemicals and improved well-stimulation methods are continually being tested and improved for use in oil and gas wells.

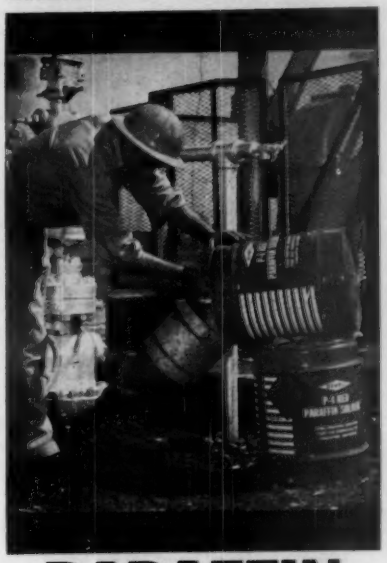
The exhibit's long-range objective is to improve employe knowledge and increase individual performance which in turn will result in better service.

API adopts coring standards

NEW STANDARDS have been spelled out by the API for coring heads and diamond bits.

A task group of the API is work-

PARAFFIN PROBLEMS?



PARAFFIN SOLVENT

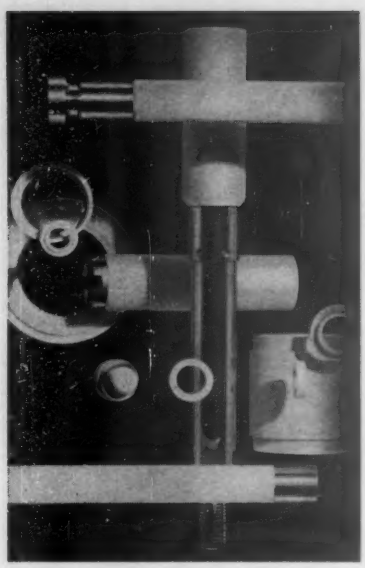
Dowell Paraffin Solvent is designed to free your wells of production-robbing paraffin. It will dissolve both pure and impure paraffin containing asphalt, sulphur, gum and salt. Effective for cleaning formation faces, tubing, rods, lead lines, tanks, screens, liners and perforations. **Non-chlorinated.** Easy to use. Easy to buy, too. Available at oil field supply stores and at Dowell stations.

Products for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL



Leading Oil Field Pump Manufacturers Use Coors Alumina Ceramics to Fight Abrasion

Leading pump manufacturers are supplying plungers of Coors Ceramic, because they wear several times longer than plungers of expensive metals.

Coors Alumina Ceramics are extremely hard—equal to a sapphire in hardness. This property makes the plungers very resistant to abrasion. The ceramic is virtually inert to chemicals—it does not corrode nor pit in service. It has a tensile strength of 17,000—18,000 PSI and a compressive strength of over 240,000 PSI.

Coors Alumina Ceramics are also used for rock bit nozzles, chokes, ball check valves, and sleeve protectors for multiple completion wells.

Chokes of Coors Ceramics are available through oil field stores. Pump plungers and other ceramic parts are available only through equipment manufacturers. If you are having abrasion or corrosion problems, ask your equipment manufacturer about Coors Alumina Ceramics!

Coors
Alumina Ceramics
COORS PORCELAIN COMPANY
600 NINTH ST., GOLDEN, COLORADO

ing to determine solutions of problems associated with variations in outside-diameter tolerances between diamond bits and coreheads offered by different manufacturers.

Problems arose when users of diamond drilling and coring equipment found it impractical to run diamond bits of one manufacture behind those of another make due to variation in o.d. tolerances. The specific objective of this task group was to establish, if possible, standards in sizes, dimensions, and tolerances for diamond drilling bits and coring bits for inclusion in Standard 7 of the API Code.

As a result of the first meeting in which members were comprised of a cross-section of diamond-bit manufacturers and users, the following recommendations were formulated:

1. Tentative API Standards for diamond drilling bits and coring bits shall be:

Bit size—	Tolerances
6¾-in. o.d. and smaller	+0 to −0.015-in.
6¾-in. o.d. to 9-in. o.d.	+0 to −0.020-in.
Larger than 9-in. o.d.	+0 to −0.030-in.

It is noted that the method for measurement of the bit diameter and tolerance shall be left to the discretion of the manufacturer.

2. These tolerances should be reviewed on the basis of the manufacturers' records of new-bit o.d. measurements compared with used-bit o.d. measurements and correlated with any reaming difficulties. It was suggested that the makers be requested to maintain 1-year records of bit serial numbers, measurements, and notations of related problems.

3. In field measurements of diamond bits, the following method is recommended:

"Go" and "no-go" gages should be made from 1-in.-thick steel leaving an outside diameter 1½ in. larger than nominal bit sizes. The inside diameters should be as follows:

Go gages = nominal bit size +0.002-in. clearance with a gage tolerance of +0.003 and −0-in. clearance.

No-go gages = minimum bit size (with maximum bit tolerance) −0.002-in. clearance with a gage tolerance of −0.003-in. and +0-in. clearance.

4. Since the nominal sizes of diamond bits will be dependent on many factors (locality, depth, formation hardness, bit type, bit wear, etc.), it was concluded that standard for selecting nominal diamond-bit sizes cannot be established at this time.

It was recognized by the group that these recommendations on bit tolerances will require review next year to determine whether they might be relaxed to benefit the manufacturer or should be modified further to preclude operating problems.

4 ADVANTAGES IN ONE!

Hooking a Sauder Type T Pressure Treater into your line gives you: 1, an Oil and Gas Separator. 2, a Free-Water Knockout. 3, a Preheater. 4, a Pressure Emulsion Treater — ALL IN ONE!

—And adjusting the water level is no longer a shutdown problem! Sauder's quick water level adjusting control adjusts in minutes . . . without taking treater out of service! Backed by 35 years of specialized oil field service!

type T treater

Write or Phone for Complete Information

Sauder
Originators of the Econo-Pak

SAUDER TANK CO., INC. • Phone DI 2-2350 • Emporia, Kansas

NEW WAX SOLVENT!

PARABAN!

Dissolves paraffin in tanks, flow lines, lead lines, tubing and annulus.

From Mud Control Laboratories comes a wax solvent that surpasses hot oil treatment . . . and costs far less! Actual field tests conducted without benefit of heat, proved Paraban to be faster acting than any competitive solvent tried.

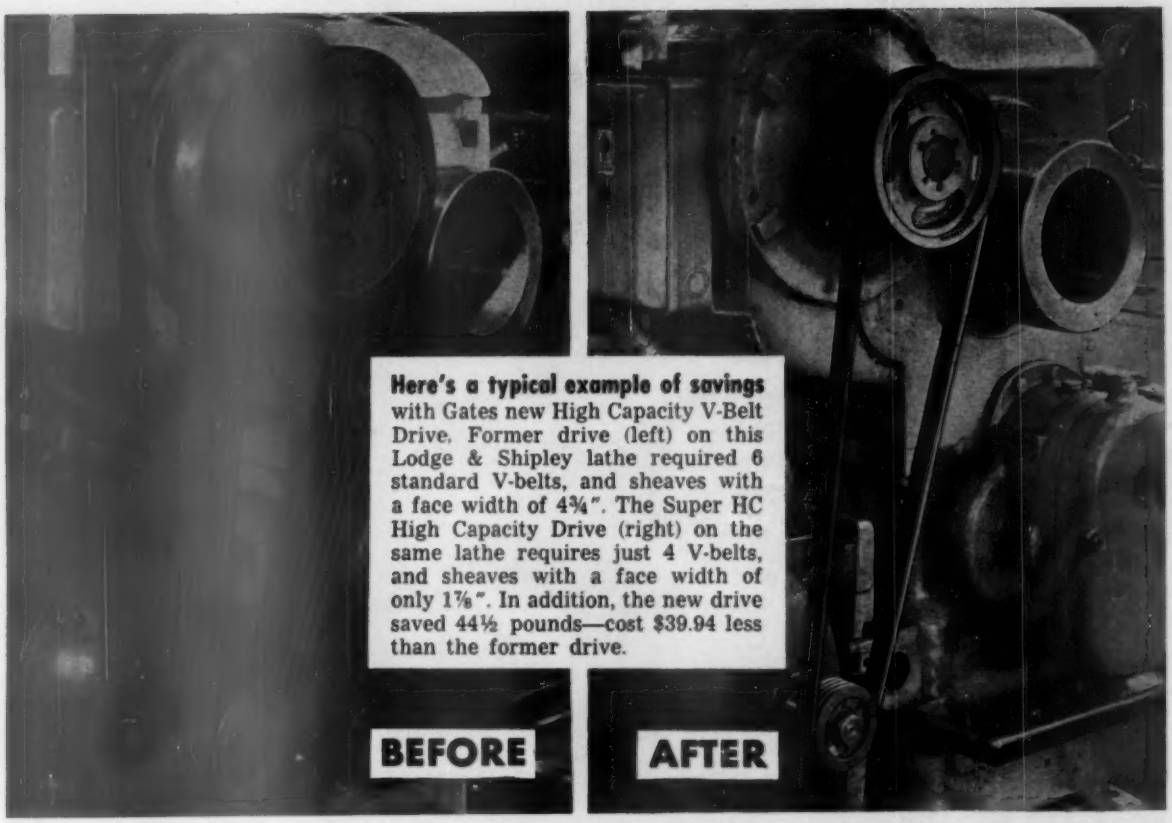
CONTAINS NO HALOGEN CHEMICALS . . .

Paraban is a mixture of hydrocarbon fractions chosen for their high solvency for waxy constituents in crude oil. Paraban contains no chlorin or arsenic.

For further information Call or Write

DRILLING MUD SERVICE
MUD CONTROL LABORATORIES
INCORPORATED

P.O. BOX 1315 • OKLAHOMA CITY



Here's a typical example of savings with Gates new High Capacity V-Belt Drive. Former drive (left) on this Lodge & Shipley lathe required 6 standard V-belts, and sheaves with a face width of 4¾". The Super HC High Capacity Drive (right) on the same lathe requires just 4 V-belts, and sheaves with a face width of only 1⅞". In addition, the new drive saved 44½ pounds—cost $39.94 less than the former drive.

Gates new High Capacity V-Belt Drives

cut costs 2 ways

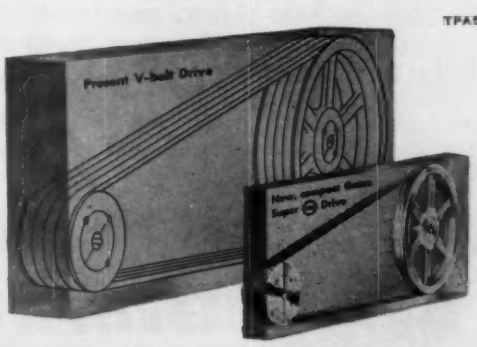
With V-belt drives on your machine shop equipment, like that shown above, and V-belt drives on your mud pumps in the field, you have 2 ways to make substantial cuts in operating costs.

In *both* cases — in the machine shop and in the field — whenever equipment requires replacement of both sheaves and belts, the higher hp capacity of a Gates Super HC Drive can save space, save weight, save bearing replacement, reduce down-time. You save *money* all along the line!

Super HC Stocks and Technical Help Readily Available

You can quickly obtain technical help on drive design and get prompt delivery of Gates new High Capacity V-Belts and Sheaves from your nearby Gates Representative or Oil Field Supply House listed in the Yellow Pages. Ask for handbook: *The Modern Way to Design Multiple V-Belt Drives.*

TPA536A



The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

Gates *World's Largest Maker of V-Belts*

Gates Super HC HIGH CAPACITY V-Belt Drives

same hp capacity in smaller "package"

...in difficult areas

On the surface, tellurometers accurate to within inches over a fifty-mile traverse are visible indicators of GSI's new look at refraction shooting.

Looking deeper, recently developed refraction interpretation techniques, special refraction instruments and seismometers are giving GSI clients subsurface data in areas where it was unobtainable in the past.

If you have prospects which refuse to yield deep data through the use of reflection shooting our new look at refraction will interest you.

For additional details, write ....

GEOPHYSICAL SERVICE INC.

900 EXCHANGE BANK BLDG. • DALLAS 35, TEXAS

A TEXAS INSTRUMENTS COMPANY

NEIL WILLIAMS, dean of Gulf Coast oil-exploration editors, examines a new contribution to geologic literature of his bailiwick. It's the New Orleans Geological Society's "Salt Domes of South Louisiana."

Salt domes under the microscope

BY FRANK J. GARDNER

FOR MANY YEARS, Gulf Coast geologists have earned their bread and butter by probing the secrets of the salt dome. As the dominating feature of coastal geology, these domes have been a challenge, a jackpot, and an enigma all at the same time.

But never until now have these coastal oil finders taken the time to sit down and record just what they have accomplished in their studies of these highly complex structures. Scattered papers here and there have provided a little background for future study, but no single source of data has been available.

The first 67 . . . The New Orleans Geological Society has now changed all this. In an impressive new publication "Salt Domes of South Louisiana," society members have put on record all available knowledge about 67 of the 112 known salt domes in the South Louisiana geologic province. The other 45 domes will be treated in a companion volume soon to be published.

In the introduction to this new book, the editors say, "Salt domes create the most prominent traps for oil and gas accumulation in South Louisiana and pose many a perplexing question as to their origin and growth. With the exception of a few field papers and several articles speculating on dome genesis, geological literature contains little basic data relative to individual domes . . ."

This is a fact-packed volume and should be a valuable addition to the library of any oil man. Every dome is accurately mapped and with a few exceptions, contoured on the top of the salt. All drilling to date is shown to scale, and those domes with an overhang are cleverly depicted by use of these contours.

In addition to the field map, there is an impressive tabulation for each dome presenting such things as location, method of discovery, discovery wells, shallowest and deepest salt encountered, the deepest test and deepest zone penetrated, productive zones, principal operators, market outlets, and a production record for oil and gas through the years. Thumbing through the book, one feels that these data could have been presented in much more detail than they were. There are many blank spaces that conceivably should have been filled with some interesting information.

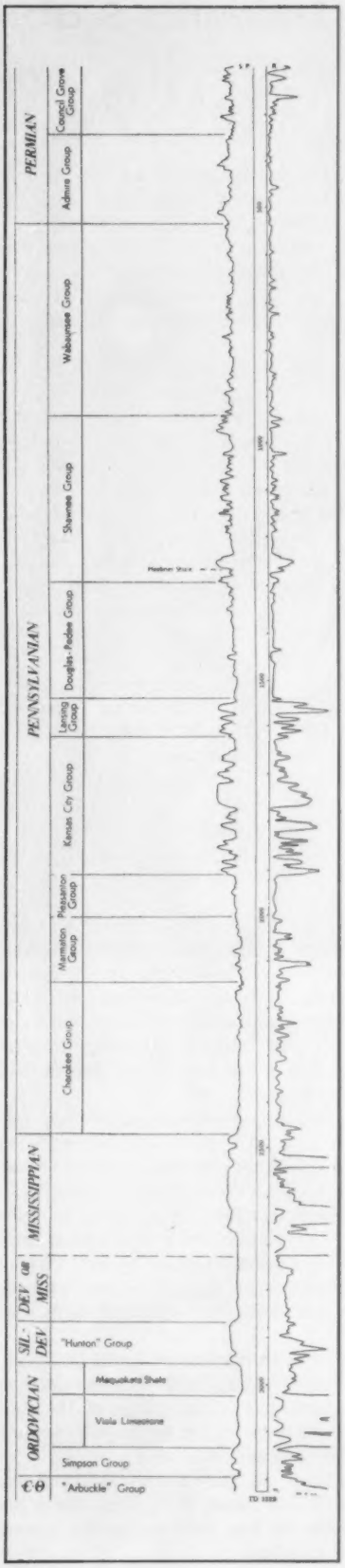
Enclosed as a frontispiece to the section on individual domes is a folded insert map showing the location of all 112 salt domes in the province. It is striking that 27 of these are offshore domes and that 20 of the 27 have been included in this interim report.

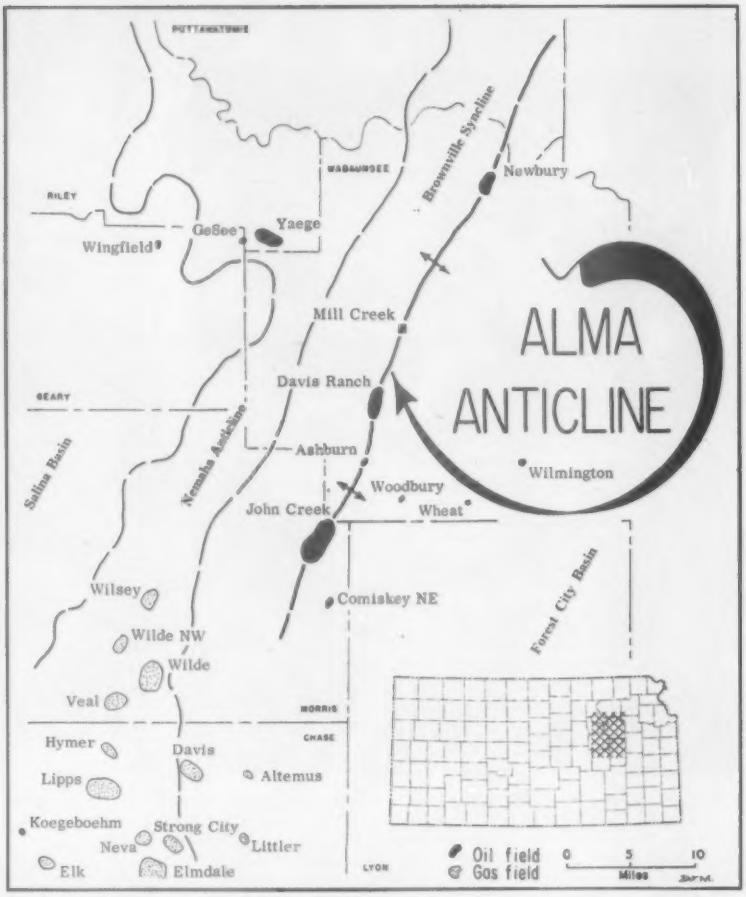
Indicate lots more work . . . Over-all the reader's big first impression is one of wonderment at the tremendous amount of work that has yet to be done in thoroughly exploring and outlining these salt intrusions. In many cases, development has been confined to only one flank or perhaps two. In others, there is an indication that drilling has been stopped at much shallower depths than would have been anticipated.

Neil Williams, as the Journal's exploration observer for the Gulf Coastal region, has followed the exploration of these salt domes for many years. When he finished examining "Salt Domes of South Louisiana," he made a characteristic remark: "It just goes to show you that you never completely finish exploration on a salt dome. Just look at Spindletop in Texas. They're still finding new pools every day. You can imagine what the Louisiana geologists have ahead of them with 112 similar targets."

To do the job that faces them now, South Louisiana oil finders have a valuable new tool. Lessons learned so far are well documented in the pages of the new NGS book, and they will no doubt be heavily applied in the future search for domal oil.

Our congratulations to the society and to the editors, Jack C. Stipe and James P. Spillers, for a job well done. The industry can now await the second volume, soon to be released.





INDEX MAP showing the Alma anticline in relation to the major structural features in part of northeastern Kansas and associated oil and gas fields. Fig. 1.

Drillers keep busy in northern Kansas

BY DANIEL F. MERRIAM
Kansas Geological Survey

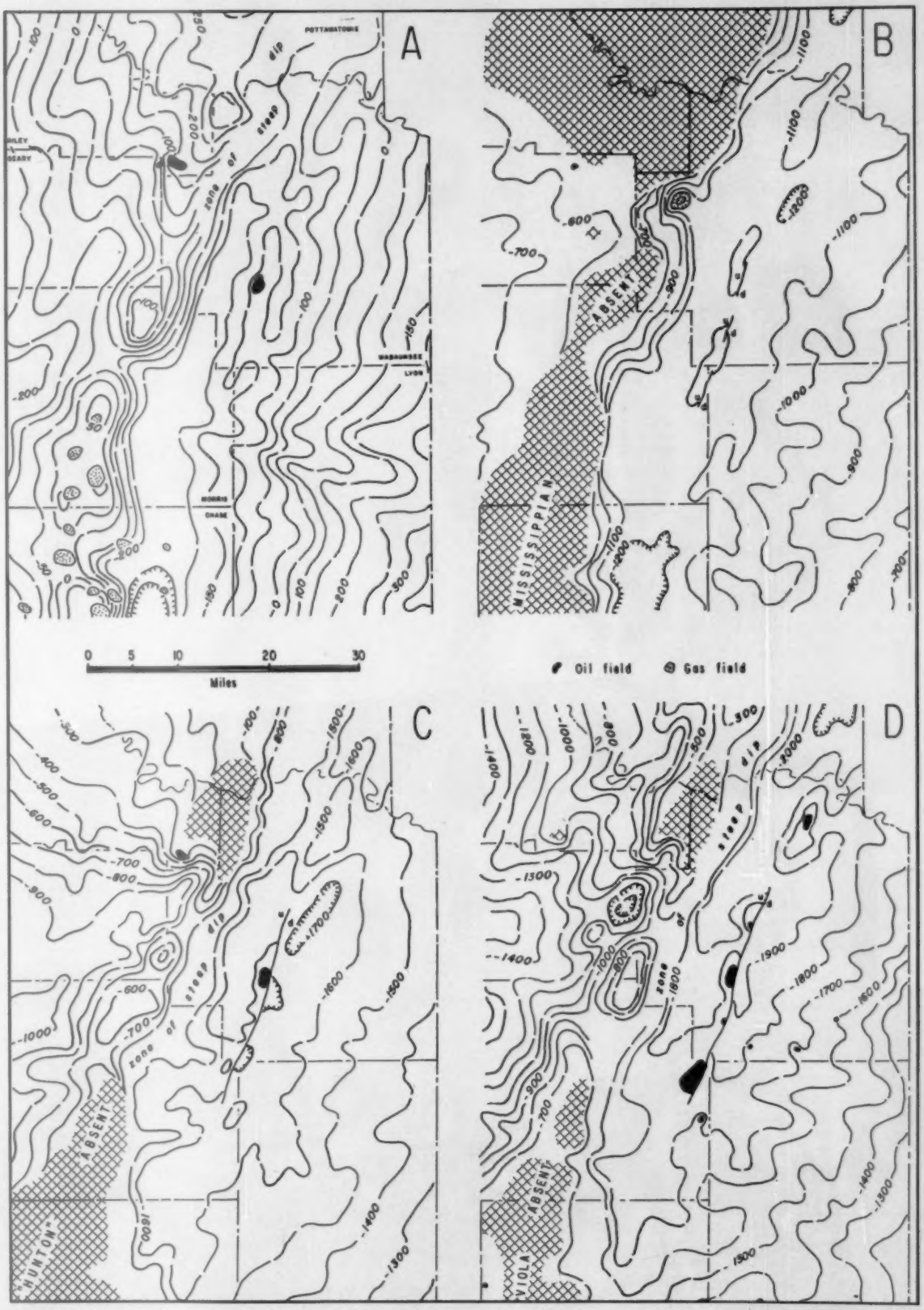
SINCE DISCOVERY of oil in Kansas over 100 years ago, exploration in the state is still active as interest during the last 18 months has been focused alternately on the northwestern and the northeastern part of the Sunflower State.

Several important finds have spurred efforts first in the one area then the other. Northeastern Kansas received attention early in September because of the failure of Gulf Oil Corp. 1 Barth (C NE¼ SW¼ 21-16s-9e) in Morris County to extend production southwestward from John Creek field along the prominent Alma anticline (Fig. 1).

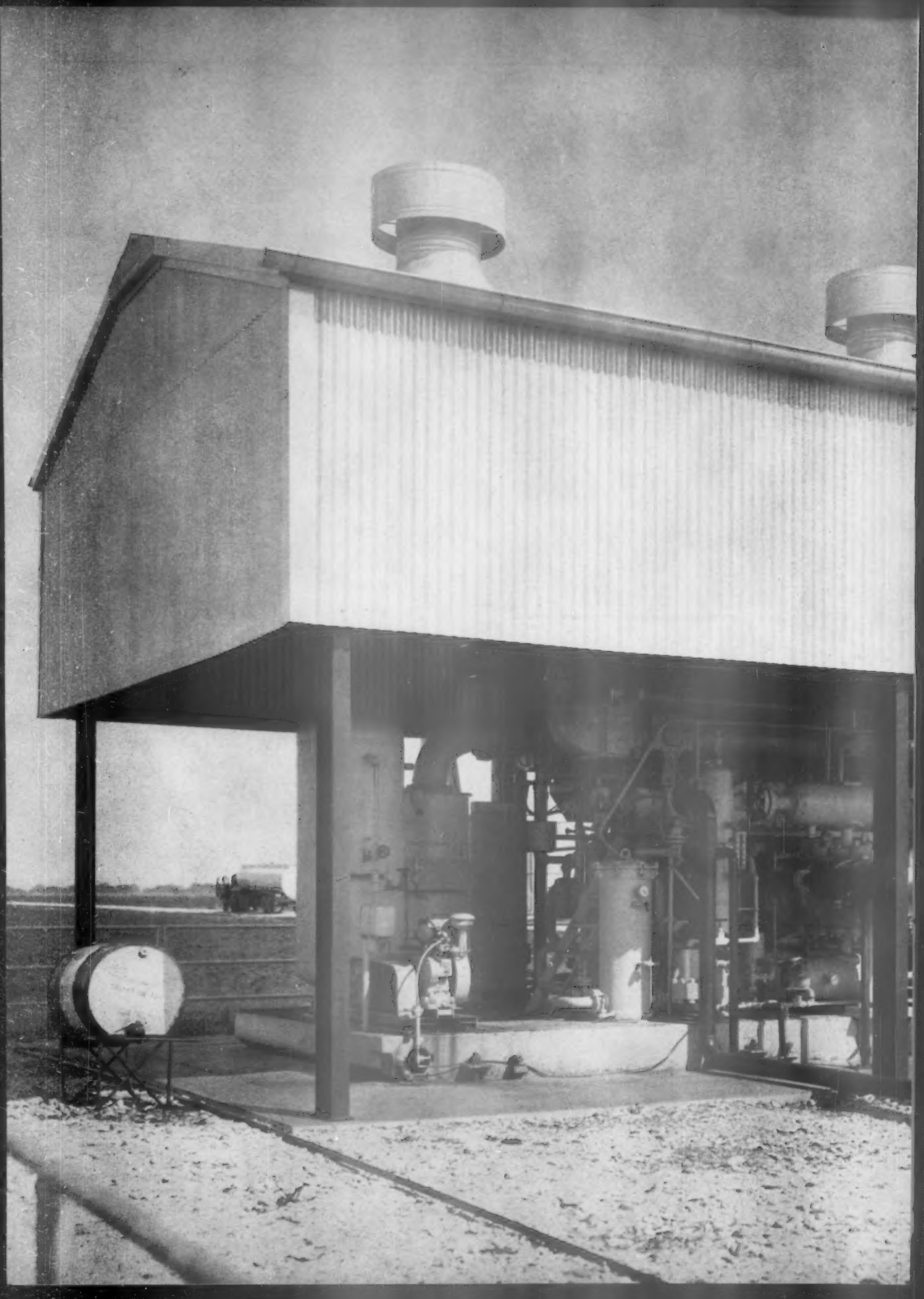
ELECTRIC LOG of the Ajax and Stanolind 1 Sharpe well (SW SW SW 24-16s-8e) in Morris County shows a typical stratigraphic sequence encountered in the vicinity of the Alma anticline east of the Nemaha granite ridge. Fig. 2.

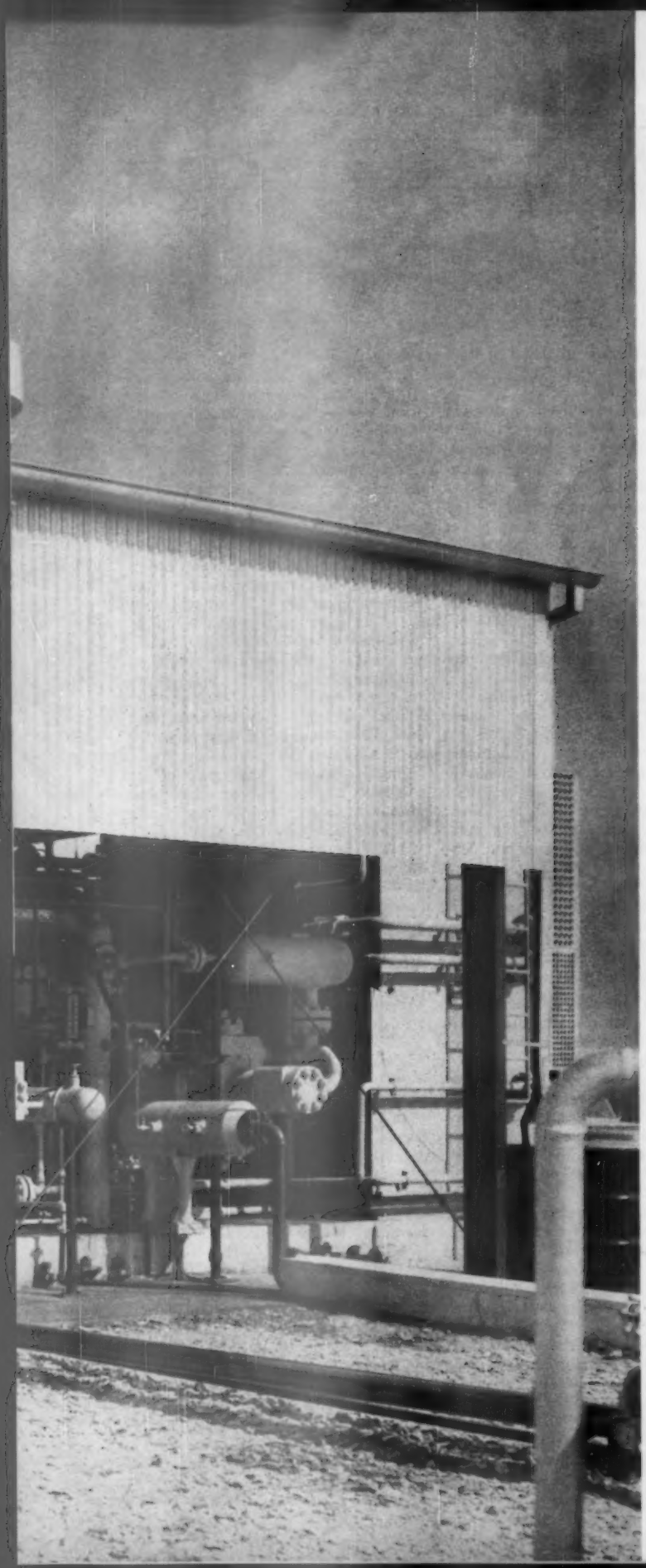
Five fields are spread over a distance of about 35 miles along the axis of this feature, and had the Gulf well been successful it would have increased the over-all distance to nearly 40 miles. Attempts also have been made to extend production to the northeast along the anticline, most recently in west-central Jackson County by William H. Pine this year and Carter Oil Co. in 1959. Success of these tests would have extended the trend 23 miles for a total distance of almost 60.

Sporadic play. Before the opening of Davis Ranch field in Wabaunsee County in April 1949, the Forest City



STRUCTURE MAPS of the Alma anticline and surrounding area, (A) structure on top of Lansing group, contour interval 50 ft. (from Merriam, Winchell, and Atkinson, 1958); (B) structure on top of the Mississippian rocks, contour interval 100 ft.; (C) structure on top of "Hunton" group, contour interval 100 ft.; (D) structure on top of Viola limestone, contour interval 100 ft. Fig. 3.





Max Powell, Chief Engineer of Russell Maguire.

FACTS REVEALED ABOUT REMARKABLE ACCEPTANCE OF SLHC

Sales up . . . and up . . . and up. That's part of the history of Worthington's SLHC gas engine-compressor. What is the secret behind this remarkable acceptance?

Listen to Max Powell, Chief Engineer of Russell Maguire, talk about an SLHC on a cycling operation in the Faith-Mag Field, ". . . we wanted something that would run all the time—this does . . . we're pleased with it! Take last May, for example. We ran the SLHC unit 734 hours. That's 98.7% operation.

"Today this Worthington SLHC engine-compressor is handling almost 6 million cfd, taking suction at 750 psi and 1000 psi, and discharging at about 5000 psi.

"No, no one operates it. It's running unattended. Why do we like it? It's getting the job done . . . wish everything did."

When asked about maintenance costs, Mr. Powell didn't know. They were negligible—hadn't been high enough to keep separately on the books.

Mr. Powell didn't mention fuel economy, as some users do. Of all "under 1,000 hp" engine-compressors on the market, the Worthington SLHC is the only one specifically designed for turbo-charging . . . and so operates on up to 21 percent less fuel.

If you want fuel economy and dependability in the same unit, there's ample reason to buy the SLHC engine-compressor. Call your Worthington representative, or write Worthington Corporation, Section 43-17, Harrison, New Jersey.

Worthington SLHC gas engine-compressor packaged by A. M. Lockett Co. and operated by Russell Maguire at a Unitized Gas Cap Cycling Project, Faith-Mag (9500' Frio) Field, Matagorda County, Texas.

WORTHINGTON

TABLE 1—OIL PRODUCTION OF THE FIVE FIELDS LOCATED ON THE ALMA ANTICLINE
(From Goebel and others, 1960)

Field name and year of discovery	Discovery-well location	Area, acres	Oil production, bbl. During 1959	Oil production, bbl. To end, 1959	Producing wells	Producing zone Name	Producing zone Depth, ft.	Producing zone Thickness, ft.	Aver. gravity
Morris County									
John Creek (1953)	26-15- 9e	980	343,857	1,254,955	39	Viola	3,090	6	26
Wabaunsee County									
Ashburn (1958)	29-14-10e	60	9,397	15,314	2	Viola	3,255	7	22
Davis Ranch (1949)	33-13-10e	980	193,200	2,448,842	19	Lans.-K. C.	1,854	4	
						Hunton	2,929	15	
						Viola	3,201	5	29
Mill Creek (1950)	2-13-10e	160	18,927	270,240	4	Viola	2,923	5	27
Newbury (1950)	11-11-11e	240	18,343	288,653	7	Viola	2,901	4	27

basin received only sporadic attention from geologists, mainly because of poor showings in the basin. Other than the fields located along the Alma structure, Kansas discoveries in Lower Paleozoic rocks in the four-state basin have been almost nonexistent.

After the Davis Ranch discovery, Mill Creek and Newbury (Wabaunsee County) were opened in quick succession in 1950, followed by John Creek (Morris County) in 1953 and Ashburn (Wabaunsee County) in 1958 (Table 1). The cumulative production from John Creek represents almost 75% of Morris County's total, whereas the four fields in Wabaunsee County account for nearly 90% of that county's cumulative production.

Although these five fields have considerable economic importance as emphasized by the proportion of their county's oil production, their main contribution is in helping to shape geologic thinking in that they and several other fields are positive proof of oil in Lower Paleozoic rocks in northeastern Kansas. This leads to the inevitable conclusion that more oil is to be found in these beds.

Penn leads in the Forest City basin, beds of Pennsylvanian age have been most prolific, but that is to be expected, since pre-Pennsylvanian production was not discovered until the early forties. Most of the Pennsylvanian oil was and is produced from Pleasanton, Marmaton, and Cherokee shoestring-type sands. Pre-Pennsylvanian production has been recorded from Mississippian, Hunton, Viola, and Simpson rocks, of which the Viola is the most important reservoir in Kansas.

Stratigraphy

The stratigraphic sequence in the vicinity of the Alma anticline in the basinal area is shown in Fig. 2. Although not depicted on the well log, Precambrian metamorphic and igneous rock floor the sedimentary section. Locally overlying the basement complex is the Lamotte sandstone of Late Cambrian age (also not shown). Rocks from top of the Lamotte to base of the Simpson group usually are collectively termed Arbuckle (only partly shown on the well log). For the most part these rocks consist of cherty or sandy dolomite.

The Simpson group is composed of the Platteville limestone (above) and the St. Peter sandstone (below). Overlying the Simpson are the cherty limestones and dolomites of the Viola, which in turn are overlain by the silty, dolomitic Maquoketa shale. The Hunton group, of Siluro-Devonian age, is composed of limestone and dolomite, which may be slightly cherty or arenaceous. Undifferentiated Chattanooga shale and Kinderhook shale of Devonian (?)—Mississippian age is stratigraphically next above the Hunton group.

The Mississippi lime is mainly carbonates but contains some shale. Local residual weathered chert on the Mississippi lime surface is sometimes called chat, or if reworked, Pennsylvanian basal conglomerate (or PBC). Permo-Pennsylvanian beds are characterized by cyclic marine and nonmarine sediments, and thin but persistent units can be widely traced, for example, the Heebner shale (Shawnee Group, Virgilian). Pleistocene and Recent sedimnets generally are confined to present river valleys.

Regional Structure

The Alma anticline is located in the southern part of the Forest City basin just east of the basinal axis, the Brownville syncline (Fig. 3).

Only the southern part of the Forest City basin is located in Kansas, limited there on the west by the north-northeast-trending generally southerly plunging Nemaha anticline and on the southeast by the low, indistinct Bourbon arch. The basinal axis closely parallels the Nemaha, giving the basin pronounced asymmetry. West of the Nemaha anticline is the large Salina basin.

Distribution of Lower Paleozoic beds in the Forest City basin is controlled by structural features. In pre-Simpson time the Southeast Nebraska arch was the dominant positive feature; the area later developed negative tendencies and the North Kansas basin resulted (Lee, 1956). A different structural grain was imposed on the area starting near the end of Mississippian time when the Nemaha exerted its influence. Since at least Middle Pennsylvanian time, structural movement has amounted to only minor adjustments and epeirogenic warping.

Pre-Pennsylvanian beds have been upturned, truncated, and overstepped along the east limb of the Nemaha anticline (Fig. 4) so that Pennsylvanian beds are locally in direct contact with Precambrian basement. Structural dip along the east flank of the Nemaha is as steep as anywhere in the state—about 10°. The trend of most basinal structures roughly parallels that of the Nemaha anticline, north-northeast; some cross structures, however, have been noted. Faults seemingly play an important part in the structural pattern in northeastern Kansas. The Alma anticline is definitely faulted along part of its east limb, and the fault becomes more prominent with depth. Other faults also have been noted.

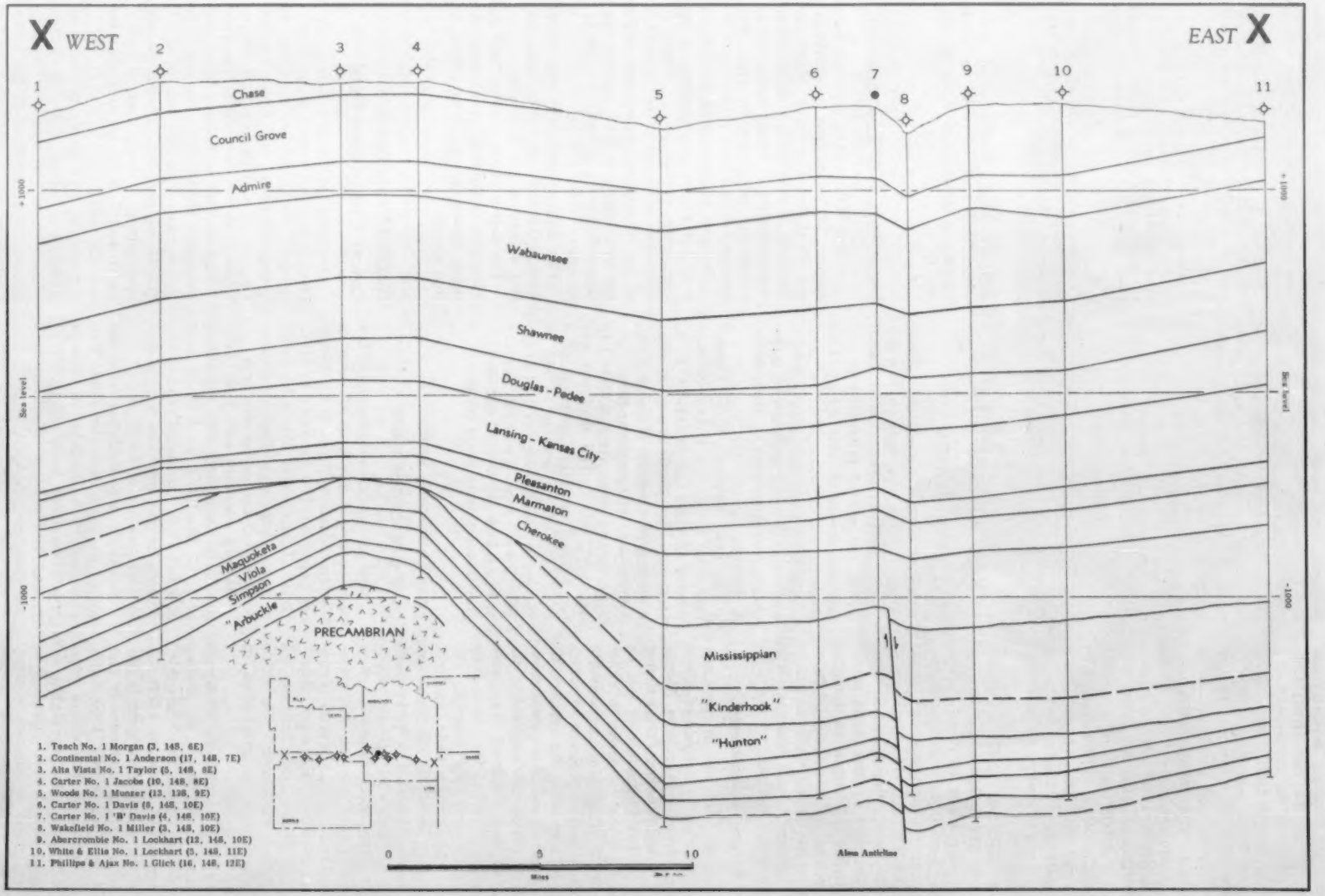
Many of the subsurface flexures have surface expression, although of less intensity, in Pennsylvanian and Permian beds. The crest of the Nemaha may be traced on the surface, and the crest of the Alma anticline is revealed by a few small surface closures (Smith and Anders, 1951).

Local Structure

All five fields located along the Alma anticline are structurally controlled by locally closed anticlines. Mill Creek and Newbury reportedly were found by core-drill work, Davis Ranch and John Creek by a combination of seismic exploration and surface geology, and Ashburn by subsurface geology. Most other fields in the vicinity of the Alma anticline also seemingly are controlled by structure.

ASHBURN (29-14s-10e), opened by Gruenerwald, is a north-northeast-trending anticline. The east limit of the field is probably a high-angle reverse fault. Closure is about 35 ft. on the Viola and is progressively less in younger beds.

DAVIS RANCH (28, 33-13s-10e; 4-14s-10e), discovered by Carter, trends almost north and has closure of about 65 ft. on top of the Viola; surface closure is about 20 ft. The



REGIONAL east-west cross-section of the Salina basin, Nemaha anticline, and Forest City basin. The Alma anticline is very much in evidence as a pronounced positive structural feature. The angle of the fault plane and upward extension of the fault are not known with certainty. Fig. 4.

structure is at least 2 miles long and ¾ mile wide, strongly asymmetrical, and faulted on the east flank. Conclusive proof of the occurrence of a high-angle reverse fault is present, according to Smith and Anders (1951).

JOHN CREEK (sections 23, 24, 25, 26, 27, 34, and 35-15s-9e; 2-16s-9e), found by Gruenerwald, is the largest producing structure along the Alma anticline. The feature trends north-northeast and is 4-5 miles long and has a maximum width of about 2 miles. Closure is approximately 70 ft. on top of the Viola. The east flank of the anticline is faulted giving the structure a decidedly asymmetrical aspect.

MILL CREEK (2-13s-10e), discovered by Skelly, is a small anticline showing only about 30 ft. of closure. It trends just slightly east of north, and the east flank is faulted.

NEWBURY (2, 11-11s-11e), opened by Skelly, is the northernmost producing structure on the Alma trend. The anticline is elongate in a northeast direction and has about 20 ft. of closure on top of the Viola, as nearly as can be determined. Seemingly the structure is not faulted.

Future Developments

The Alma anticline is presently known to extend a distance of about 40 miles, from northeastern Morris County to southeastern Pottawatomie County, and this structure or one en echelon to it may continue in either direction. It is certainly conceivable that additional petroleum reserves may be located along the anticline by diligent seekers, and if not on it, surely close by. Although exploration results in the last couple of years have not been spectacular, they have been encouraging—note, for example, the opening of Ashburn field in 1958 and a good show of oil found by Carter to the northeast in west-central Jackson County seemingly on structure. Close attention should be given to several zones, not just the Viola-Lansing-Kansas City, several Pennsylvanian sands, "Mississippi lime," "Hunton," Viola, and Simpson all have been productive; "Arbuckle lime" should not be overlooked in planning prospects.

Exploration is relatively cheap in the Forest City basin, as drilling depths to the top of the "Arbuckle" are intermediate (2,000 to 4,000 ft.), and surface structure mapping is reliable. As a general comment it may be said that the Forest City basin, with exception of production from shallow Pennsylvanian sands, has not been adequately tested, especially in the deeper parts. In addition to structural traps, future prospects include strat traps along the eastern flank of the Nemaha anticline where lower Paleozoic beds wedge out (Merriam and Goebel, 1956).

Future petroleum explorers in the Forest City basin should undertake their task optimistically and prove there is no case for the "barren basin."

Publication authorized by Director, Kansas Geological Survey; E. D. Goebel and P. L. Hilpman kindly reviewed the paper and R. H. King edited the manuscript.

Bibliography

Goebel, E. D., Hilpman, P. L., Beene, D. L., and Noever, R. J. "Oil and gas developments in Kansas during 1959." Kansas Geological Survey Bull. 147, in press.

Lee, Wallace, "Stratigraphy and structural development of the Salina Basin Area." Kansas Geol. Survey Bull. 121, p. 1-167, 1956.

Merriam, D. F., and Goebel, E. D., "Kansas' structural provinces offer varied types of traps": The Oil and Gas Journal, V. 54, No. 52, p. 141, 143-145, 147-149, 151, 153-154, 1956.

Merriam, D. F., Winchell, R. L., and Atkinson, W. R., "Preliminary regional structural contour map on top of the Lansing Group (Pennsylvanian) in Kansas." Kansas Geol. Survey Oil and Gas Inves. 19, map 1958.

Smith, R. K., and Anders, E. L., Jr., "The geology of the Davis Ranch oil pool, Wabaunsee County, Kansas": Kansas Geol. Survey Bull. 90, pt. 2, p. 13-52, 1951.

Texas wildcat hits two pay zones

A WILDCAT off the east central side of the old Midway field in San Patricio County, in Texas' central coastal region, has proved productive of gas and condensate in two deep Frio sands.

Nearest comparable production is more than 2 miles southeast in a discovery well completed by Humble Oil & Refining Co. in 1952.

The new discovery is by Cosden Petroleum Corp. and Dillard & Waltermire Drilling Co. at their 1 T. A. McKamey. Its location is 4 miles northwest of Gregory. It also is about 3 miles west of Geronimo field.

Productive zones are at 9,460-87 ft. and 9,977-92 ft. The shallower pay has a rated open-flow potential of 4 M.M.c.f.d. of gas, making 54 bbl. of 56°-gravity condensate per 1 M.M.c.f. The lower zone tested for 11 M.M.c.f.d. of gas with 57 bbl. of 57°-gravity condensate per 1 M.M.c.f.

East Louisiana well gets gas condensate

New gas-condensate production has been opened in the Bon Air area of eastern Calcasieu Parish, in southwestern Louisiana. The discovery, by H. L. Dillon, Jr., is about 2½ miles north of gas-condensate production found by Superior Oil Co. earlier this year.

Dollon's discovery well, 1 W. Boudreaux, is completed with a gas-flow of 1,722 M.c.f.d. from 5 ft. of sand at 9,743-48 ft. Gas-liquid ratio is 33,769 cu. ft. per bbl. The well is shut in with pressure of 3,475 psi.

Superior's new field has been designed as South Bon Air field. Two wells have been completed so far with production from sands at 10,088-93 ft. and 10,468-74 ft. Discovery well was completed in April.

The area is just across the Jefferson Davis Parish line from the original Bon Air field, discovered in 1945, where there are 11 wells in sands ranging in depth from 9,600 to 10,700 ft.

New Texas Wilcox opened

A new Wilcox-sand area has been opened for production in southeastern McMullen County, Southwest Texas. It is just east of Rhode field, and northwest of Brazil field, both of which also are productive from Wilcox sand.

The new discovery well, Blair-Vreeland 2-B Rhode, is completed in the Slick zone, perforated at 7,500-5 ft. Open-flow potential is 14 M.M.c.f.d. of gas. Gas-liquid ratio is 34 M.c.f. per bbl. Liquid is 60.3°-gravity condensate. Flowing pressure through ¼-in. choke was 2,143 psi.

The Luling zone also was tested with perforations at 7,746-52 ft., getting a flow of gas with water.

The well is about 3 miles from the Live Oak County line, and about 20 miles southwest of George West, in that county.

South Mississippi adds Lower Cretaceous field

Discovery of another Lower Cretaceous field is reported in South Mississippi. Discovery well, drilled by George Harrison and Larco Drilling Co., is in southwestern Wayne County, on the east side of the state.

Pay zone is in Rodessa sand, perforated at 11,917-27 ft. The well, 1-26 U.S.A., tested for 122 bbl. of 42.7°-gravity oil per day, flowing through open tubing. A deeper zone at 11,907-24 ft. had 7 ft. of oil saturation but was not tested.

Location is 2 miles southeast of Thompsons Creek field. Production there is from the shallower Washita-Fredericksburg section of the Lower Cretaceous, and Tuscaloosa sand of the Upper Cretaceous.

NEW TWO-IN-ONE TOOL

the **HALLIBURTON** *T a/c*

designed to

ANCHOR TUBING IN TENSION & CATCH TUBING IF IT SHOULD PART

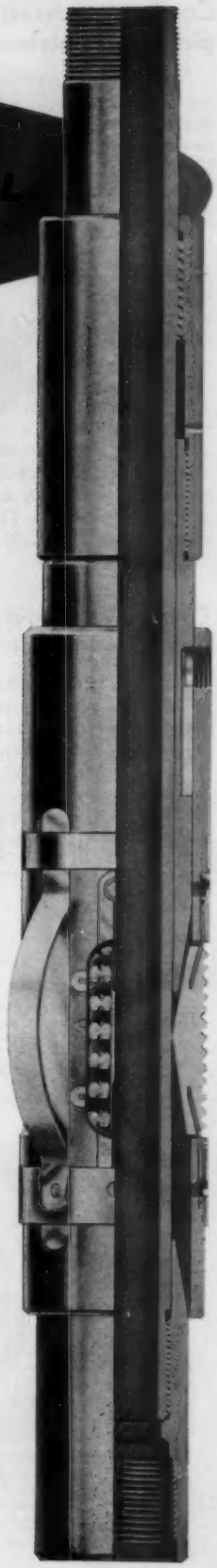
Have you looked into the advantages of setting tubing in tension in your pumping wells? Here are a few...

- Increased pump efficiency by reducing restrictions on plunger travel.
- Less breathing and buckling of tubing by reducing tubing stretch.
- Less wear on tubing and rod couplings as well as on threaded connections in the pump.

Performing its *anchor* function, the Halliburton Tubing Anchor/Catcher is set by simple tubing manipulation, and the tubing pulled into tension. Corrosion resistant parts make this sensibly priced tool ideal for most any well.

Once in the well, the *catcher* feature of the new Tubing Anchor/Catcher reduces costly fishing jobs. After the tubing is placed in tension, if a tubing break should occur above the tool, downward movement of the tubing will reverse the position of the slips from lower to upper wedge to prevent further downward movement. Since the tubing movement before the slips are re-engaged is just a few inches, the resulting fish is normally a straight, easily retrieved string... not a twisted, jagged stack of steel.

Get the full story on this new two-in-one tool from your Halliburton Representative. Ask for the Tubing Anchor/Catcher Brochure.



OTHER FEATURES TOO!

SETS EASILY — whether *you* pull it up, or a *break* pulls it down!

RELEASES EASILY — from either direction!

EXTRA SAFE — slips may be retracted to neutral position by tubing rotation, if necessary.

275 SERVICE CENTERS . . . JUST MINUTES AWAY FROM YOUR WELL

HALLIBURTON

COMPANY • DUNCAN, OKLAHOMA

Cambrian interest picks up in Nebraska

Nebraska's Cambrian play is picking up momentum. U. S. Smelting, Refining, & Mining Co. completed two wells and Midwest Oil Corp. and Skelly Oil Co. each have tested oil shows in Sleepy Hollow field, Redwillow County.

U. S. Smelting 1-36 State, NE NW 36-3n-27w, pumped 115 bbl. of oil per day from Reagan sand at 3,446-52 ft. This is a south offset to the Murfin Drilling Co. discovery of Sleepy Hollow field earlier this year. The second Reagan well was Franco-Central Oil Co.'s find in NW NW 1-2n-27w, 1¼ miles south of the discovery. Pubco Petroleum Co. was successful at the west offset to this well. U. S. Smelting just completed another Cambrian well just north at 2-36 State in SW SW 36-3n-27w. The Reagan well pumped 108 bbl. daily from perforations at 3,506-13 ft.

One new oil pool discovered in Illinois in September

One new oil pool, Blackland North in Macon County, was discovered in Illinois in September according to the Illinois Geological Survey.

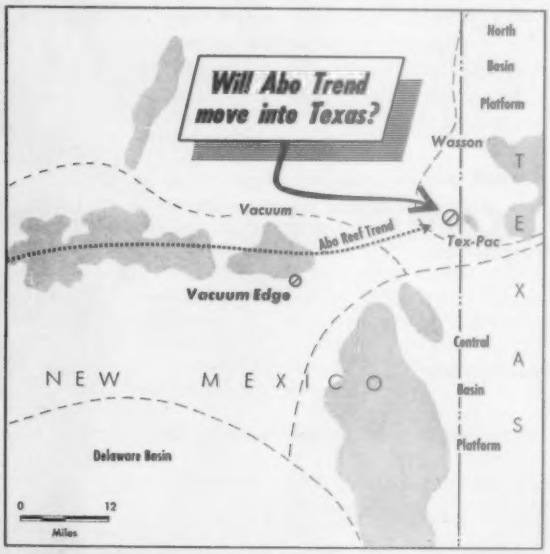
There were eight extensions to pools, as follows: one oil well each to Goldengate Consolidated pool in Edwards County, Aden South pool in Hamilton County, Cravat West, and Divide East pools in Jefferson County, Olney Consolidated pool in Richland County, and Johnsonville West, Covington South, and Aden Consolidated pools in Wayne County.

A total of 152 wells was completed in September, an average of 38 a week for the 4-week period. The September completions include 60 oil wells, a success ratio of 39%. In addition, five wells that had previously been completed as dry holes were worked over and recompleted as oil wells.

Five of the September completions were drilled deeper than 4,000 ft.—one in Fayette County, one in Saline County, and three in Wayne County. The well in Fayette County, Humble Oil & Refining Co. 1 Webber-Horn unit in 28-8n-3e, was drilled to a total depth of 8,616 ft. to granite. It is not only the deepest well drilled during the month, but the deepest well ever to have been drilled in Illinois.

Toto Gas Co. 1 T. R. Porter in 20-7s-7e, Saline County, was drilled to a total depth of 5,192 ft. as a dry hole. The Allen Beard 1 Walter G. Atteberry in 21-2s-7e, Wayne County, was drilled to a total depth of 5,368, plugged back to 3,910 ft. and completed as an oil producer in the Salem formation. Peake Petroleum Co. 1 Feathers et al., in 14-2s-6e, was plugged back to 4,249 ft. from a total depth of 5,300 ft. and completed as an oil well in the Harrodsburg limestone. Also in 14-2s-6e, Wayne County, Dee Drilling Co. 1 Friend was drilled as a dry hole to a total depth of 4,310 ft.

Estimated production for Illinois for September is 6,517,000 bbl.



A NEW MEXICO WILDCAT may hold the answer to the question, "Will the Abo trend move into Texas?" Texaco Inc. 1 R. J. Byers, 5 miles northeast of Knowles in northeastern Lea County, is testing after finding oil in the Abo reef at 8,348-54 ft. Location is 1 mile northwest of nearest production at Tex-Pac field in Gaines County, West Texas.

In southwestern Lea, 20 miles northwest of Hobbs, Standard Oil Co. of Texas 2 Vacuum Edge unit, flowed 32 bbl. per hour on test of the Abo at 8,341-98 ft.

Big well completed in Clay County, Illinois

In Clay County, 5 miles northeast of Flora, Ill., McCollum & Kincaid and Marvin Walker completed the 1 Smith Heirs in SE NW SW 11-3n-7e, pumping and flowing 500 bbl. of oil per day, natural. Production is from McClosky Mississippian lime at 2,937-42 ft. Location is ¾ mile from similar production.

Kentucky. In Henderson County, Burns Drilling Co. and Frank Wolter are testing the McClosky "C" and "D" limes at 2,536-66 ft. The 1 Irvin Hunter, 21-O-23, 3 miles west of Robards, pumped and flowed 105 bbl. of oil per day through choke.

Fourth well scheduled in northern California

In California's most northerly drilling play, Zephyr Oil Co. is preparing to start its fourth well.

The Long Beach company has completed three shallow gas wells since making its discovery of Table Bluff field in Humboldt County last spring. The last well, completed in mid-September, flowed at a rate of 1,400 M.c.f.d. through a ⅞-in. choke from perforations at 2,090-2,110 ft. Production is from the Repetto formation (Lower Pliocene).

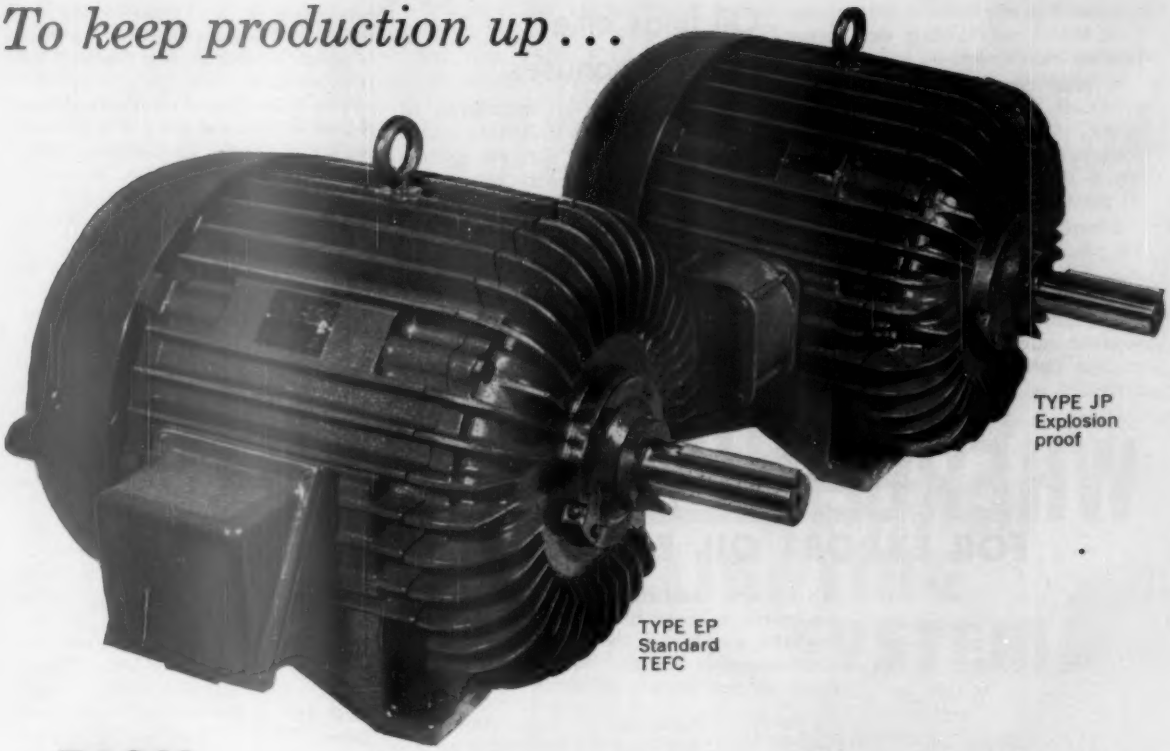
The new test, Leon Oro Blanco T-4, will be located in 35-4n-2w. Ben Ownes Drilling Co. is contractor on the well. The well will fall about 1½ miles northwest of the T-3 and will go to a projected depth of 4,600-4,700 ft.

Michigan's Lee gets favorable drill-stem test

In Michigan, Sun Oil Co. 1 Walter, SE NE SE 22-1s-5w, Lee Township, Calhoun County, had encouraging drill stem in the Salina-Niagaran section at 3,060 to 3,120 ft. The well had gas to surface in 5 minutes and gaged 44 M.c.f. with 2,600 ft. oil in drill pipe after 2 hours. Drilling is going ahead to original Trenton-Black River objective, roughly 5,000 ft.

The Sun test is located 1,320 ft. east of the Cal-Lee pool Trenton discovery, 9 miles northwest of the Albion end of the Scipio trend. A wildcat drilled 18 months ago by Otterbine and associates 1 Midlan, C SE SE 12-1s-5w, 2½ miles to the northeast,

To keep production up...



PICK FROM THIS PROTECTED PAIR...

Here's a power-packed pair of Wagner® totally-enclosed fan-cooled motors —Type EP, standard, protected against damage from dust, abrasive, fumes, steel chips or filings; and Type JP, explosion-proof, for safe use in specified hazardous locations.

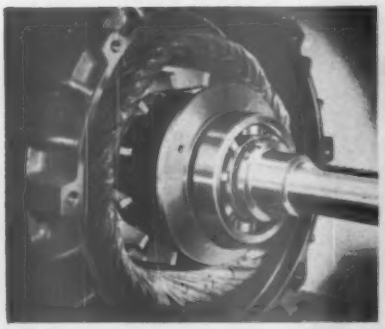
They'll keep your production rates up, delivering full rated horsepower under the toughest conditions . . . staying on the job with dependable, continuous service that means peak output. They're the perfect pick, for individual machines or for automated lines.

In the design illustrated, these motors are built in ratings through 100 hp in NEMA frame sizes 182-445U. Let your Wagner Sales Engineer show you how this protected pair (or larger Wagner enclosed motors through 500 hp) gets the job done. Call him, or write us for Bulletin MU-224.

Wagner Electric Corporation

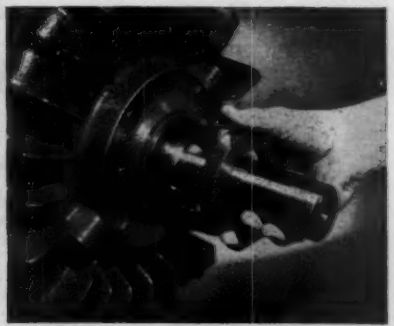
6389 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

WM60-19



HEAVY-DUTY BALL BEARINGS . . . The ball bearings used in these motors are of the highest quality, with more than ample capacity to provide long, troublefree service under heavy loads.

BEARINGS CAN BE RELUBRICATED . . . Factory lubrication will last for many years under normal service, but openings are provided to permit relubrication that adds years to motor life under severe conditions.



SECURELY SEALED FOR LOW MAINTENANCE . . . Both ends of these motors have running shaft seals to keep the bearings clean. Bearing housings are effectively sealed to prevent escape of grease.

completed in the same zone for over 3 M.M.c.f. gas, drilling the deeper Trenton section dry.

A good part of the wildcat play northwest of Albion has been based in part on the possibilities of Salina-Niagaran gas or oil potential. Sun's test is the first to show commercial oil possibilities.

Petrolia Corp. completed 1 Cline, SW SE SW 18-2n-5w, Carmel Township, Eaton County, dry at 5,462 ft. with Trenton logged at 4,757 ft. A porosity zone at 5,117 to 5,145 was negative on drill stem. It was the first of four Eaton County wildcats state-permitted to Petrolia.

Oil finds hike Alberta bonuses

THREE separate oil discoveries in two different regions of Alberta drilled to evaluate lands in a recent government land auction were responsible for high bonuses being paid for the rights. All three of the strikes were closely guarded secrets until after the sale with one remaining on a semi-confidential listing.

Two of the new finds were drilled within 6 miles of each other in the central west sector of the province. One of them indicated successful oil production in the Turner Valley sector of the Mississippian while the other is possibly Alberta's best Cardium oil strike to date.

The Mississippian oil discovery was drilled by Imperial Oil Ltd. and Hudson's Bay Oil & Gas Company, Ltd., near the town of Shilo, some 70 miles north-northwest of Calgary. Although not drill-stem-tested, it did indicate success during a wire-line evaluation that recovered 130 cc. of light-gravity oil plus a small amount of methane and water. Enough encouragement was evaluated from that test plus cores and logs to warrant the setting of production casing to 8,800 ft. The well will be evaluated with a service rig at a later date.

The other venture in the same area, 5½ miles to the east, flowed oil from the Cardium sand. It was drilled by Supertest Petroleum Corp., Ltd., and Altana Exploration Co. (subsidiary of the Montana Power Corp.) on lands acquired under farmout agreement from Hudson's Bay Oil & Gas Co., Ltd. It contains an approximate 20-ft. gross pay sector of which nearly 15 ft. is regarded as net pay. A drill-stem test of the section immediately below 7,222 ft. gave gas at a maximum rate of 500 M.c.f.d. That flow, however, decreased to zero as fluid entered the pipe and oil flowed in 45 minutes. Rate of flow was not released and due to the very high pressure encountered during the test pipe has yet to be pulled from the hole. It is anticipated that after mud weight is increased sufficiently to allow the pulling of pipe, and if pressure holds, drilling will once again resume and the Mississippian sector will also be evaluated.

The other new discovery well was drilled by Great Plains Development Co. of Canada, Ltd., on British American Oil Co., Ltd., farmout lands in the Lousana district of Central East Alberta. This venture is 80 miles northeast of Calgary. All that has been reported on this well, Great

WHERE is the buying power
FOR EXPORT OIL EQUIPMENT?

It's right in the fields and plants where equipment is to be used. The men who buy and specify are the same men who are responsible for the use and maintenance of petroleum equipment.

In the No. 1 export market, Latin America, the right man for your products may be English or Spanish speaking. However, one thing is certain, he is in Latin America. And PETROLEO INTERAMERICANO's bi-lingual pattern serves him best. That's why more and more sales managers back up their field selling with advertising in PETROLEO INTERAMERICANO.

Latin America is the No. 1 export market, and PETROLEO INTERAMERICANO is the only "saturation" media for the market.

Concentrate your export advertising dollars. Use PETROLEO INTERAMERICANO to cover the market that accounts for 75% of the exports of petroleum equipment.

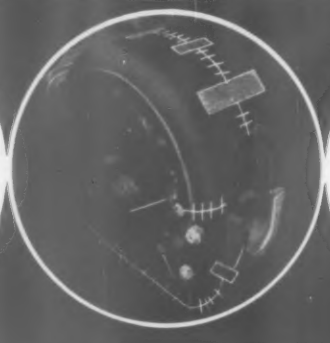
PETROLEO
INTERAMERICANO

THE PETROLEUM PUBLISHING CO.
211 SOUTH CHEYENNE
TULSA, OKLAHOMA

ABP ABC

We Call It Metal Surgery

Our unique cold working methods for repairing cracked or broken castings weighing from a few pounds to many tons—and restoring them to their original condition is NOW available to thousands of cost-conscious industrial equipment users. Send for our detailed brochure.



REYNOLDS FRENCH and Company
2316 LAND ERRINGS ROAD
TULSA 7, OKLAHOMA
Specialists in Repairing cracked or broken castings

Plains-B.A. 16-19-36-21 Lousana, is that it uncovered an oil zone in the D2 zone of Devonian and that further information on it will be made available after the well is cased and extensive production tests are completed. Rumors circulating, meanwhile, place it as quite a substantial find with oil-flow rates of up to 35 bbl. per hour reported.

All three of the strikes were drilled to evaluate lands contained in Drilling Reservations offered by the Alberta government for public tender. The Imperial-H.B. 4-26-36-5 Shilo, on LSD 4, 26-36-5w5, lies 6 miles north of Cardium oil production in Garrington oil pool and 5½ miles west of the Supertest find. It was drilled to evaluate lands contained in Parcel 747, a tract of 8,480 acres for which the team jointly paid $286,000, or $33.75 per acre. However, following the drilling of a well within the boundaries of it, selection of 2,240 acres of leases are allowed from it at which time, therefore, the price per acre could jump to $127.75 per acre.

The Supertest-Altana-H.B. 10-26-36-6 Caroline venture, on LSD 10, 26-36-6w5, was appraising Drilling Reservation No. 746, a tract of 8,640 acres. As the Cardium zone appears to be so prolific, Altana paid a bonus of $712,000 for the rights. That averages out to $82.41 per acre, or $317.86 per acre when 2,240 acres are selected out of it as lease.

Great Plains' well, 16-19 Lousana, on LSD 16, 19-36-21w4, was drilled as an evaluation of Parcel 743, a tract of 7,520 acres out of which 1,760 acres may be selected as lease. Great Plains and British American tendered $617,761 for that tract and therefore paid an average of $82.15 per Reservation acre, or $351 for each of the acres contained in it that are leaseable.

Ohio successes boost Stark County play

In Ohio, further successes in Lake Township, Stark County by Atlas Exploration Corp. and Belden & Blake have expanded this play in several directions.

Recent combination completions scored by Atlas Exploration Corp. were 1 S. Spuhler, Section 18, 1,693 M.c.f.d. and 10 bbl.; 1 J. & M. King, Section 20, 1,200 M.c.f.d. and 10 bbl.; 1 H. F. Bowers, Section 17, 250 M.c.f.d. and 35 bbl.; 1 F. Price, Section 8, 300 M.c.f.d and 30 bbl. The 1 W. & H. Kurtz, Section 21, was shut in as a gasser with 1,007 M.c.f.d. after fracture.

Belden & Blake reported final results of fracturing the 1 F. Faylor, Section 9 and 1 J. Overholt, Section 10, to be 1,003 M.c.f.d. with 1,355 psi. and 4,300 M.c.f.d. with 1,340 psi. respectively.

In addition to these completions nine more locations are presently active in the area. The average finished depth through the Clinton sand is about 4,500 ft.

Dual completion flows oil in Kingfisher well

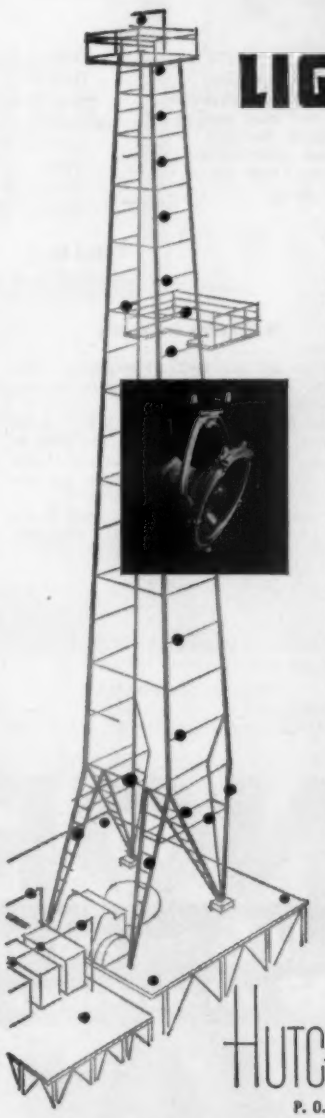
Another prolific well was added to the North Dover area in Kingfisher County, Oklahoma. Newest big oiler is Humble Oil & Refining Co. 2 Katie Patterson in NE NW 13-18n-7w.

The well flowed 480 bbl. of oil per day from Manning Mississippian at 6,900-25 and 6,928-54 ft. through 24/64-in. choke. From Mississippian at 7,242-66, 7,276-82, and 7,145-96 ft. the well made 528 bbl. daily through 24/64-in. choke.

Oregon test drills ahead

An important wildcat in Oregon, Humble Oil & Refining Co. 3 Thomas Creek unit, is nearing its projected

"FLOLIGHT" DERRICK LIGHTING SYSTEMS



"FLOLIGHT" the quality derrick lighting system that requires no extra components.

When your drilling rig is equipped with a "Flolight" vaportight lighting system, you have a complete lighting arrangement. All motor leads, dog house lights, pump lights, etc., are included. There's nothing extra for you to buy.

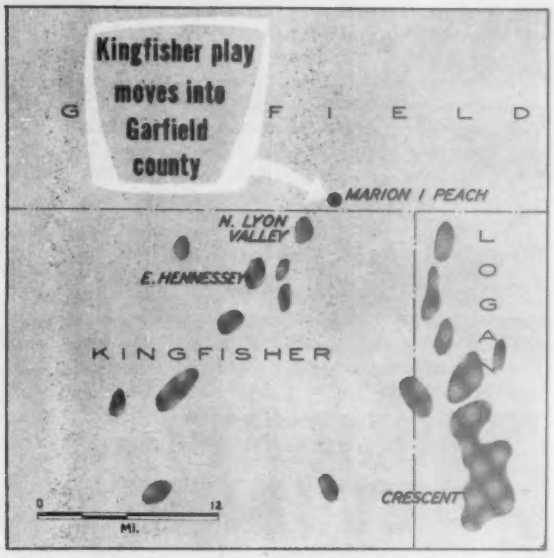
"Flolight" systems are built specifically for drilling rigs, as a result you get more usable light for every dollar you invest. Each "Flolight" is mounted on a neoprene shock absorber that protects lamp filaments from breakage; eliminates the swaying of light fixtures in high winds. Light fixtures are constructed of aluminum alloy throughout, there's no enamel to chip, crack, or rust. Extra heavy, high temperature Pyrex lenses do away with cumbersome guards.

"Flolight" vaportight lighting systems are sold through supply stores everywhere.

HUTCHISON MANUFACTURING COMPANY

P. O. BOX 9335 • HOUSTON 11, TEXAS

A SUBSIDIARY OF REVERE ELECTRIC MANUFACTURING CO.



A GARFIELD COUNTY wildcat moves the Kingfisher play farther north in Oklahoma. Marion Oil Co. 1 Henry Peach in SW NE 32-20n-5w, flowed 25 bbl. of oil per day and 1 M.M.c.f.d. from 12/64-in. choke in Cleveland Pennsylvanian sand at 5,660-75 and 5,678-88 ft. From open hole at 6,322-95 ft. it flowed 6 bbl. of oil per hour. From perforations at 6,322-71 ft. it flowed 10 bbl. per hour.

September Multiple Completions

	Dual	Triple
Arkansas	2	2
California	8	..
Kansas	4	..
Louisiana	34	5
North	..	1
South	22	..
Offshore	12	4
Mississippi	2	1
New Mexico	10	..
West	8	..
East	2	..
North Dakota	1	..
Oklahoma	14	3
Texas	44	8
District 2	10	1
District 3	7	1
District 4	11	2
East	1	2
District 7-B	2	..
West	10	1
District 9	2	..
District 10	1	1
Total U. S.	**119**	**19**

depth of 12,000 ft., but it may be taken below this point.

The test is drilling ahead below 11,696 ft. It is located in 18-36s-18e in Lake County, about 30 miles north of the California border and 22 miles northwest of Lakeview, Ore. Humble has several thousand acres under lease in the area.

Discovery wells

ARKANSAS

Logan County:

Post Petroleum Co. 1 H. E. Turner, C SW SE 15-6n-28w, 2¾ miles northwest of Booneville. IP 1,750 M.c.f.d., open-flow potential, shut-in TP 1,050 psi., perf. 2,577-2,701 ft., Atoka-Turner sand. TD 5,678 ft. Reentered former dry hole. Extends Chismville field 2¼ miles southwest.

WESTERN CANADA

Alberta:

Zapata et al. 16-27 Forestburg, LSD 16, 27-40-15w4. Basal quartz oil discovery. TD 3,650 ft.

Altair-Katex 7-6 Throne, LSD 7, 6-36-9w4. Viking oil discovery. TD 3,555 ft.

Cities Service-B.A. 3-26 Sturgeon Lake, LSD 3. 26-72-24w5. Cadomin gas discovery. TD 10,053 ft.

Dynamic-Western 7-13 Atlee, LSD 7, 13-22-8w4. Mississippian gas discovery. TD 3,180 ft.

British Columbia:

Sinclair et al. A-79-F Dogrib, A-79-F-94-G-1, Triassic gas discovery. TD 5,792 ft.

Saskatchewan:

Husky A1-36 Waseca, LSD 1, 36-48-24w3. Sparky oil discovery. TD 1,865 ft.

NORTH LOUISIANA

Catahoula Parish:

JMO Co. and Tensas Delta Land Co. et al. 1 Isaac Boatner, 5-6n-5e, 1¾ miles southeast of Walters. IP 84 BOPD (net), 10% b.s. and w., 10/64-in., 38°, TP 340 psi., perf. 4,915-25 ft., Wilcox. TD 5,110 ft. Discovery well of Boatner Brake field.

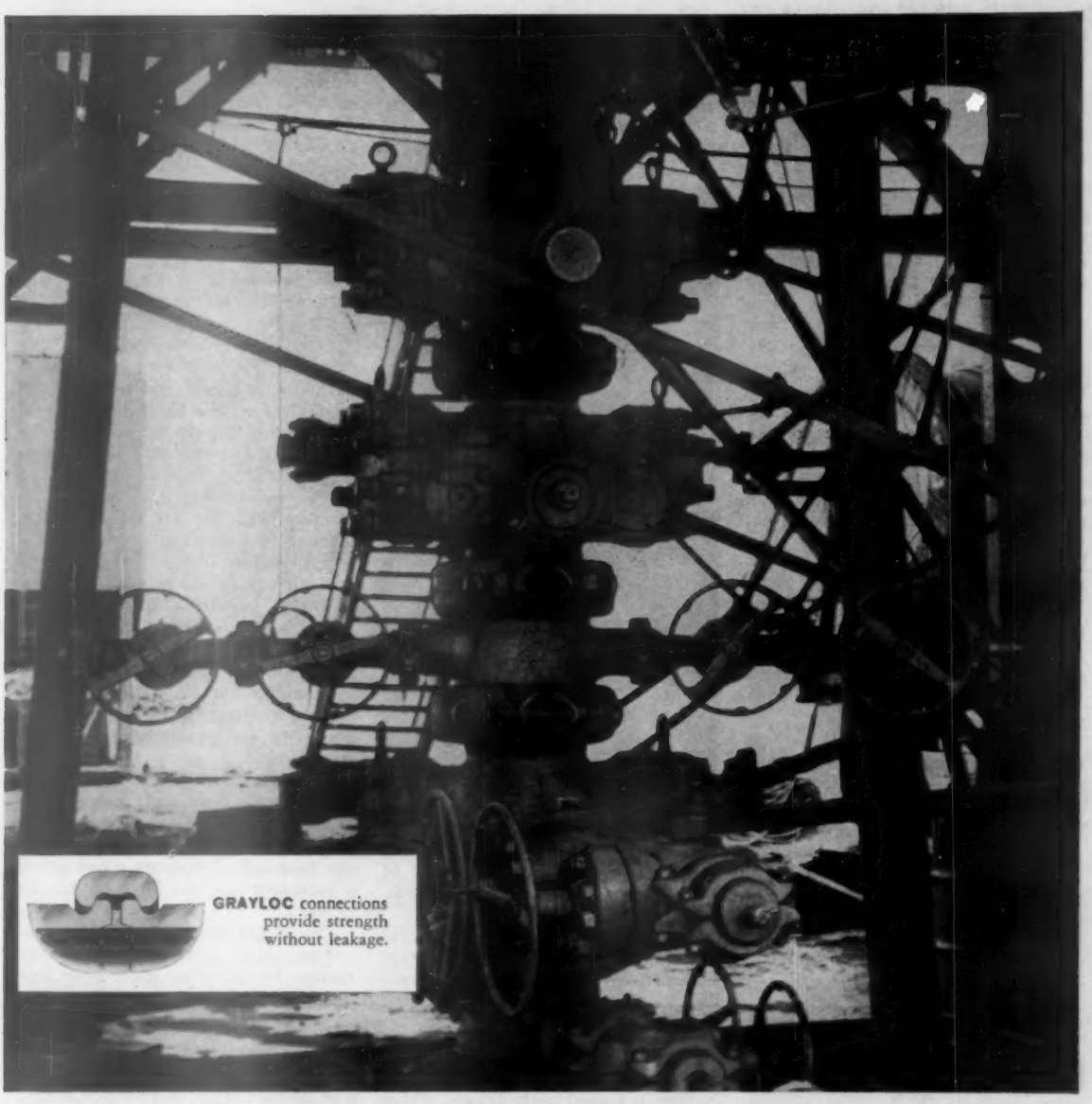
Webster Parish:

Bodcaw Co. 1 Bodcaw-Coyle unit, 32-22n-10w, 2 miles north of Cotton Valley. IP 140 BOPD, 20/64-in., 48°, GOR 1,243 cu. ft. per bbl., TP 1,400 psi., perf. 9,340-75 ft., Cotton Valley-Justiss sand. TD 9,424 ft. Extends Cotton Valley field 1⅛ miles west.

NEBRASKA

Hitchcock County:

Excelsior Oil Co. et al. 1 Schaffert, NE NE 4-2n-31w. IPP 288 BFPD, 90% oil, 10% water, Lansing-Kansas City, 3,765-3,902 ft. TD 4,336 ft. Lansing-Kansas City discovery, new field.



GRAYLOC on Well Head and Control Equipment Safely Withstood 7,300 PSI

This all Grayloc assembly, in use on a well in Eastern Venezuela, withstood well pressures of 7,300 psi during drilling operations — proving that Grayloc equipped assemblies provide the greatest possible blow-out protection. The assembly required no additional tightening after the original make-up.

It took a native crew less than six hours to nipple-up this Grayloc equipped well head and control assembly, and it required approximately 24 inches less substructure height than a comparable flanged hook-up.

Learn how Grayloc connections can save you extra hours and money on control systems with complete blow-out protection.

Write for the new Gray Catalog *today*.

GRAY *Tool Company*

6002 P. O. Box 2291 Houston 1, Texas Riverside 7-1240

White Terms Research Vital

. . . to a company's destiny in this age of technological advances. He'll stress this view at Atlantic Refining.

A YOUTHFUL EDUCATOR who has lived closely with industry is the new vice president and general manager of research and development for Atlantic Refining Co.

Prof. Robert R. White, 44, director of the Institute of Science and Technology at the University of Michigan, has taken over this key department in a company that is one of the pioneers in the petroleum industry.

Dr. White brings to the job an awareness that "a company's future, in this era of technological explosion, depends on its ability to capitalize on new knowledge. Any company that follows a policy of doing only what it has been doing is not being conservative; it is undertaking a great risk."

Education and experience . . . Born in Brooklyn, Dr. White was graduated from Cooper Union Institute, New York, with a BS in chemical engineering in 1936.

He earned MS and PhD degrees from the University of Michigan, and also attended Brooklyn Polytechnic Institute and DePaul University Law School.

Joining the University of Michigan faculty as an instructor in chemical engineering in 1942, he was made a professor in 1948. In 1958, he became associate dean, college of engineering, and associate dean, Horace H. Rackham school of graduate studies. A year ago he was named director of the institute of science and technology.

Dr. Robert R. White
. . . from campus to corporation.

At various times Dr. White has been employed as a chemical engineer by Universal Oil Products Co., Standard Oil Co. of California, Dow Chemical Co. and Calco Chemical Division, American Cyanamid Corp. He has served as technical consultant to some 20 corporations and holds several awards for advancement in education and science.

His own research has ranged from azeotropic and extractive distillation to catalysis and rate processes.

The transition . . . Dr. White finds both similarities and differences in academic and corporate life.

"To be an effective professor," he observes, "you must be well grounded in theory, of course, but you must put your ideas on the firing line as well. You do this through research and development, and especially in engineering by working with industry."

"A good teacher does not tell his students what to do. He stimulates them to be intellectually more active. If the teacher kindles the spark, the students will do the rest. This process is just as important in industrial research, where one must not only build and maintain a strong, aggressive organization but must also insure that the freedom and inspiration so necessary in research is maintained even under the constraints of a corporate environment."

On differences, Dr. White says, "Corporate effort has the glorious touch of reality. The ground rules are real, easily identifiable, although they can be tough. Corporate effort offers a good objective and focus for human intellect."

Dr. White will miss the direct involvement in technical projects, although he plans to get deeply into

▶▶▶ Personals

Vernon P. Dorweiler has been named technical-computing supervisor at the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.).

Harold Aab has been appointed Farmington, N. M., district superintendent for Skelly Oil Co. He succeeds **P. E. Cosper,** who has retired.

Frank F. Axtell, construction engineer in the utilities division of Texaco Inc. in Houston, has been transferred to Port Arthur, Tex., as construction engineer, maintenance division.

Harry H. Lawson is president of Universal Production Service, Inc., new Midland, Tex., contract drilling and production firm. Lawson was vice president and manager of Canadian Seaboard Oil Co. in Calgary before Seabord's merger with Texaco. Other officers of the new company are **Lamar Eschberger,** executive vice president; **Everett L. Smith,** secretary-treasurer; and **Archie P. Parr,** field superintendent.

W. D. McEachron has been appointed manager of long-range planning for Standard Oil Co. (Ind.). **C. E. Leibacher** has been named economist, industry economics, and **C. R. Jung** has been appointed economist, general economics.

Dr. William R. Ayers, manager of planning in Monsanto Chemical Co.'s plastics division, Springfield, Mass., has been appointed director of the new planning department, plastics division. **William J. Sadlowski** has been appointed manager of economic planning in the new department.

Bernard M. Yoshitani, job engineer with Mobil Oil Co. in Torrance, Calif., has been transferred to New York as senior engineer with Socony Mobil Oil Co., Inc.

Merle S. Keffer will be in charge of operations in the new Lafayette, La., office of Cactus Petroleum, Inc. Keffer moves to Lafayette from Cactus' Houston office.

James E. White, supervisor of physics at Ohio Oil Co.'s Denver research center, has been appointed research associate on the staff of the research director. He will continue to headquarter in Denver and will conduct independent research and serve as company-wide consultant in several scientific fields. **Robert B. Rice,** senior research scientist, will succeed White as supervisor of physics at the Denver center.

particular problems now and then—"just to keep my hand in."

The job . . . Dr. White feels there are compensations in being further removed from laboratory research.

One has a better understanding of how to set up an environment in which fruitful research can be achieved.

As a research executive, he will have to provide a climate in which a very special breed—the research scientist—can work productively.

An important task will be the attraction of top men from colleges and universities in competition with the glamour and pay of electronics, aircraft, and missile fields.

"If you were a young graduate, would you rather improve the burning characteristics of furnace oil or build a moon rocket?" he asks.

But he believes that oil is increasing its lure through the application of new techniques and by expansion into new product fields.

Dr. White also is concerned with the problems of converting the present-day researcher's highly specialized terminology into language intelligible to management and the public.

The man . . . Atlantic's new vice president has broad interests — mathematics, chemical engineering, the philosophy of science, and the larger aspects of education.

He enjoys performing with string quartets as a clarinet player, and likes a challenging bridge game. An outdoorsman as well, he sails, plays tennis and golf, and swims.

Dr. White lives with his wife and four children in Gladwyne, Pa., a suburb of Philadelphia.

William L. Hiss, geologist with Texaco Inc., has been transferred to Bismarck, N. D., from Norman, Okla.

LeRoy Lane, production engineer with Sinclair Venezuelan Oil Co. in Barinas, Venezuela, has been transferred to Silsbee, Tex., as production engineer for Sinclair Oil & Gas Co.

Norman B. Adams, plant engineer for Tidewater Oil Co. in Monahans, Tex., has been transferred to Odessa, Tex., as field engineer.

Forrest S. Woodside, senior geologist with Sunray Mid-Continent Oil Co., has been named Wichita district geologist. **W. R. Oglesby,** geologist, has been named senior geologist in Corpus Christi, Tex. **George R. Fuselier,** junior geologist, has been promoted to geologist in Lafayette, La.

Charles R. Burnette, geologist with Tennessee Gas & Oil Co., has been transferred to Corpus Christi, Tex., from Jackson, Miss.

A. M. Smith, assistant foreman for Sinclair Oil & Gas Co. in Carthage, Tex., has been promoted to district foreman in Logansport, La.

W. T. Jones has been promoted to senior chemical engineer in the process-technical division of Humble Oil & Refining Co.'s Baytown, Tex., refinery.

E. L. Dildine, staff analyst with Standard Oil Co. of California in San Francisco, has been named assistant manager of crude-oil purchases and sales for Standard Oil Co. of Texas in Houston. **W. E. Nygren,** staff regional geologist for Standard of Texas in Houston, has been promoted to senior staff regional geologist.

Raymond J. Hunt, administrative manager of the northwest sales region of Standard Oil Co. (Ind.) in Minneapolis, has been promoted to supervisor of market development in the U. S. and Canada. **John C. Rauch,** a district manager in Chicago, has been appointed supervisor of marketing development for Indiana Standard's operating companies. **Henry J. Hart** has been named supervisor of market research, and **F. Lewis Phillips** has been named cost-control supervisor, marketing.

Canadian Husky Oil, Ltd., has realigned senior management responsibilities as a step in integration of Canadian and United States operations. **Lawrence W. Lee, M. R. McArthur,** and **Geo. S. Buchanan** have been named senior vice presidents. Lee will coordinate manufacturing and marketing. McArthur will direct production and drilling and is president of Husky's partially owned subsidiary, Rimrock Tidelands, Inc. Buchanan is in charge of foreign operations and special projects. **T. G. Wise,** vice president, will be directly responsible for refining and marketing. **Arthur C. Knight,** vice president, will direct development of new markets and marketing ideas and will be responsible for public relations and advertising. Other vice presidents are **W. E. Powell,** land and exploration; **Maurice E. Smith,** law; and **Arnold Larsen,** finance. **Jesse D. Winzenried** is assistant to the president and director of industrial relations. These officers will constitute a new executive committee which will act as an internal board to coordinate operations and policies planned by the board of directors.

▶▶▶ Personals

Edward W. Midlam, staff executive in the manufacturing department of Cities Service Petroleum, Inc., has been elected vice president and general manager and a director of Cit-Con Oil Corp. Cit-Con is jointly owned by Cities Service Co. and Continental Oil Co. Midlam joined Cit-Con in 1950 as process engineer. He was manager of technical services for the company before moving to Cities Service Petroleum in New York in 1957.

Louis Anderson, head of the process-engineering division, technical department, at the Bayonne, N. J., refinery of Humble Oil & Refining Co.'s Esso Standard division, has been transferred to the Charleston, S. C., refinery on a year's rotational assignment.

Glynn M. Schuchardt, Sinclair Oil & Gas Co. has been elected president of the Southwest Louisiana Geophysical Society of Lafayette, La. Other new officers include **B. S. Flowers,** Shell Oil Co., first vice president; C. B. Vidrine, Tidewater Oil Co., second vice president; **John T. Murphy,** Atlantic Refining Co., secretary; and **Glen E. Hunter,** Cities Service Oil Co., treasurer. **R. H. Hollenbaugh,** Petty Geophysical Engineering Co., is outgoing president of the group.

L. E. Cranston, manager of Mobil Oil Co.'s Paulsboro, N. J., refinery, has been named manager of the Beaumont refinery. **R. C. Hartman,** operating superintendent at Paulsboro, has been named manager of the East Chicago refinery and **W. B. Kleihege,** assistant manager at East Chicago, has been named Casper, Wyo., refinery manager. Former managers **P. L. Smith,** Beaumont; **W. W. Reed,** East Chicago; and **E. T. Pummill,** Casper, will retire January 1. **S. W. Thomson,** assistant manager at Paulsboro, will succeed Cranston as manager there. **B. L. Rodzianko,** manager of the East Providence, R. I., plant, has been named assistant manager at Paulsboro. **A. H. Fuller,** engineering and maintenance superintendent at East Providence, has been named manager there. **R. E. Maescher,** operating superintendent of the Torrance, Calif., refinery, will succeed Hartman as Paulsboro operating superintendent.

Personals

Lester T. Potter, president of Lone Star Gas Co., was elected president of the American Gas Association last week at the close of the annual convention in Atlantic City. Potter, who served as vice president this year, succeeds **Wister H. Ligon,** president of Nashville Gas Co., as head of the industry organization. He becomes the third president of his company to head AGA, following **L. B. Denning** in 1936 and **D. A. Hulcy** in 1951. Other new AGA officers are **Edward H. Smoker,** president of United Gas Improvement Co., Philadelphia, first vice president; **John E. Heyke,** president of Brooklyn Union Gas Co., Brooklyn, second vice president; and **Charles H. Mann,** treasurer of Columbia Gas System, Inc., New York City, treasurer.

POTTER

Steven J. Leach has been transferred from Humble Oil & Refining Co.'s Midland, Tex., area office to Andrews, Tex., as senior petroleum engineer.

Robert L. White, field engineer for Tidewater Oil Co. in Lafayette, La., has been promoted to reservoir engineer and transferred to Midland, Tex.

John R. Ingram, special assistant to Standard-Vacuum Oil Co.'s lubricating and special-products supply manager, has been named manager of the lubricating and special-products supply department. He succeeds **Frank V. Williams,** who recently was named refinery manager for Stanvac's refining subsidiary in Durban, South Africa.

George F. Kuhn, administrative assistant to **T. B. Kimball,** executive vice president, operations, of Sinclair Oil Corp., has been elected a director of Sinclair & BP Sales, Inc. The company is jointly owned by Sinclair and British Petroleum. **Vincent R. D'Alessandro** has been named director of industrial relations for Sinclair and its subsidiaries. He will be responsible for all functions concerning union relations of the Sinclair companies. Kuhn has been with Sinclair since 1926. He has served as administrative assistant in the manufacturing department and manager of refinery economics, manufacturing department, in New York. D'Alessandro has been with the company since 1945.

James B. Smith has joined Continental Oil Co. in Ponca City, Okla., as research geochemist in the exploration-research department.

William H. Foster, Jr., has joined Breuer & Curran Oil Co., Chicago, as geologist in Dallas. He had been geologist with Speller & Key, Inc., in Tyler, Tex.

Robert M. Bull has been appointed assistant manager of Creole Petroleum Corp.'s export sales department. **William A. Konrad** will succeed Bull as head of Creole's sales-development section.

E. G. Jackson, Jr., exploitation engineer in Shell Oil Co.'s Corpus Christi, Tex., division, has been transferred to the Houston division in the same capacity. **G. E. Klein,** Houston exploitation engineer, has moved to the Midland, Tex., area. **G. L. Dolton,** geologist, has been transferred to the Houston area from Denver.

Charles R. Landers, division engineer for Gulf Interstate Co. in Albuquerque, has joined Bechtel Corp. as division engineer in Spokane, Wash.

A. R. Field, senior staff engineer for Continental Pipe Line Co. in Ponca City, Okla., has been promoted to assistant district superintendent with Cherokee Pipe Line Co., an affiliate, in Wood River, Ill.

G. N. Uhler, resident engineer with Gulf Interstate Co., has been transferred to Lefors, Tex., from Winslow, Ariz.

Northern Natural Gas Co. has named 16 men to the new post of superintendent of integrated operations in a further reorganization of the operating division. The new superintendents will be responsible for plant and pipeline activities at their headquarters. They are: **W. F. Johnson,** Hobbs, N. M., **T. F. Teel,** Skellytown, Tex.; **J. C. Waters,** Spearman, Tex.; **R. D. Schollenbarger,** Hugoton, Kans.; **C. M. Floyd,** Holcomb, Kans.; **C. R. Wood, Jr.,** Beaver, Okla.; **C. O. Caywood,** Mullinville, Kans.; **E. J. Gardner, Jr.,** Bushton, Kans.; **H. D. Rice,** Clifton, Kans.; **J. B. Stewart,** Beatrice, Kans.; **S. B. Willhite,** Lincoln, Neb.; **Q. D. Colson,** South Sioux City, Neb.; **A. H. Minchow,** Oakland, Iowa; **C. L. Anglin,** Ogden, Iowa; **Sigurd Vikesdal,** Ventura, Iowa; and **J. F. Reid,** Paullina, Iowa. In other changes, new compressor-plant superintendents will be: **C. L. Mitchell,** Andrews, Tex.; **G. K. Floyd,** Florey, Tex.; **S. J. Michno,** Skellytown, Tex.; **R. M. Woods,** Mullinville, Kans.; **T. M. Knox,** Macksville, Kans.; **J. L. Hinzman,** Bushton, Kans.; **L. T. Martin,** Clifton, Kans.; **L. D. Harral,** Beatrice, Neb.; **L. F. Harbour,** Oakland, Iowa; **C. B. Innis,** Ogden, Iowa; **G. E. Woelke,** Ventura, Iowa; and **W. V. Werner,** Redfield, Iowa. Named compressor and process-plant superintendents were **J. E. Beck,** Hobbs, N. M.; and **W. V. McGehee,** Sublette, Kans. **J. L. Mills** has been named assistant compressor-plant superintendent at Grayco, Tex. **Frank Kreie, Jr.,** McCamey, Tex., **F. A. Rarden,** Hobbs, N. M., and **C. P. Beck,** Beaver, Okla., have been named district superintendents.

Franklin S. Wade has resigned as chairman of Southern California Gas Co., but will continue as a director of Southern California Gas and Southern Counties Gas Co. Wade had been chairman of Southern California Gas since 1950. He is a past president of both companies.

James C. Storm, executive vice president of Diversa, Inc., has been elected president of Tidelands Drilling Co., a Diversa subsidiary. He will headquarter in New Orleans.

H. T. Chilton, maintenance superintendent for Service Pipe Line Co., has been promoted to assistant general manager of the company, a new position. He will head the operating department, which has been reorganized to combine operation, maintenance, and construction functions. The change follows retirement of **Charles W. Butler,** operating superintendent since 1945. Butler joined the company in 1919. In other appointments, **F. V. Cook,** master mechanic, has been promoted to technical supervisor of stations, a new position. **A. M. Hill,** line maintenance superintendent, has been promoted to technical supervisor of lines, also a new post. Reporting to Cook will be **E. V. Grable,** who has been named machinery and buildings supervisor, a new position, and **J. O. Holder,** who has been named electrical and communications supervisor. **J. W. Foster** will be mobile equipment supervisor, with **A. S. Munneke** as superintendent for special electrical assignments. **R. M. Carter,** who has been named lines and tank supervisor; **A. I. Zumwalt,** shop superintendent; and **F. W. Zilm,** contracting administrator; will report to Hill.

CHILTON

Don S. Willhelm has been named chief engineer for Trans-Southern Pipeline Corp., subsidiary of Transcontinental Gas Pipe Line Corp. Willhelm had been senior engineer in charge of special operating department projects for Transco. He has been with the company since 1950. Trans-Southern plans to build a 60,000 bbl. daily LPG line from Houston to Danville, Va. Construction is scheduled to begin next spring.

New members of SunOlin Chemical Co.'s Philadelphia engineering staff are **Thomas G. Reynolds,** project manager; **H. Harold Bulkowski** and **M. M. Mattia,** process engineers; and **Samuel L. Palese,** civil engineer.

R. B. Grady, head of the chemical-problems group in the chemical-products laboratory at Humble Oil & Refining Co.'s Baton Rouge refinery, has been named economic analyst with Esso Export Corp. in New York. **J. O. Terry,** designer in the mechanical-engineering department at Baton Rouge, has been given a 4-year loan assignment with Iranian Oil Services, Ltd.

Charles M. Cutbirth, former plant manager of the Santiago de Cuba refinery of Texaco Inc., has been named plant manager of the Amarillo, Tex., refinery. He succeeds **John R. Cutler,** who has been promoted to supervisor of the refining department's expense-control division in Houston. Cutbirth has been with Texaco since 1929. He was superintendent of the Puerto La-Cruz, Venezuela, refinery before being named head of the Cuban plant in 1955.

Ronald E. Pohle, geophysicist with Oasis Oil Co. of Libya in Tripoli, has been transferred to Ohio Oil Co. in Casper, Wyo., as geophysicist.

A. W. Meyer, Oklahoma City district geologist for Atlantic Refining Co., has retired after 34 years with the company.

Robert E. Johnston, Jr., formerly South Texas district geologist for Bridwell Oil Co. in Alice, Tex., has opened offices as consulting geologist in Corpus Christi, Tex.

Clinton Dow Mims has been appointed assistant general manager, producing department, for Standard Oil Co. of California, Western Operations, Inc. Mims, formerly vice president of production for Standard Oil Co. of Texas, was recently transferred to the exploration and production staff of California Standard, the parent company. Also, **C. W. Gibbs,** who had been assistant general manager of producing operations, and **H. J. Maxwell,** California Standard's assistant general manager for gas natural gasoline operations, have retired.

Burwell Spurlock, group supervisor at California Research Corp.'s Richmond, Calif., laboratory, has been promoted to engineering associate in the petroleum process-development section. **Dr. Louis P. Lindeman,** research chemist, has been promoted to senior research chemist in the analytical and physical-measurements section, Richmond. **Dr. J. O. Clayton** has been named research scientist, patent liaison, Richmond, and **Dr. Allan S. Hoffman** has joined the company there as research engineer in chemical-product development. At the La Habra, Calif., laboratory, **T. L. Russell,** research engineer, has been promoted to group supervisor in drilling research and offshore problems.

Personals

W. A. McElhannon has been promoted to senior supervising engineer in the technical department, cracking and light ends division, at Humble Oil & Refining Co.'s Baytown, Tex. refinery. He will head the light-ends equipment section, which is responsible for design of new equipment and maintenance of light-ends processing units at Baytown.

O. Landis Hurley, assistant superintendent of the mechanical division at the Whiting, Ind., refinery of Standard Oil Co. (Ind.), has been promoted to mechanical division superintendent. **Robert W. Mecklin,** general foreman, has succeeded Hurley. **Joseph Collins,** assistant general foreman in the crude-stills department, has been promoted to general foreman of the catalytic-cracking department. **Max Weberling** and **M. E. Roller** have been named general foremen in the mechanical division.

W. H. Dickinson, Esso Research & Engineering Co., Florham Park, N. J., has been elected chairman of the petroleum industry committee of American Institute of Electrical Engineers. **L. B. Eddy,** Mount Prospect, Ill., consultant, is vice chairman of the committee, and **E. B. Turner,** General Electric, Pasadena, Tex., is secretary. Subcommittee chairmen are **J. J. Sonnier,** Shell Pipe Line Corp., Houston, transportation; **W. E. Withers,** Sun Oil Co., Beaumont, Tex., production; and **G. H. St. Onge,** Esso Research & Engineering Co., Madison, N. J., refining.

Deaths

J. Gordon Wakefield, 60, Taos, N. M., independent operator, died October 4 in a Taos hospital. Wakefield was with Pure Oil Co. before setting up his own business in Tulsa in 1942. He moved to Taos in 1959.

Ogilvie Henry Sheldon, 70, retired Denver independent operator, died October 5 at his home in Denver. Sheldon moved to Denver from Tulsa in 1955. He retired 2 years ago because of poor health. In Tulsa he had been active in exploration and production in partnership with two brothers, Charles M. Sheldon and William W. Sheldon. He was the father of Ruth Sheldon Knowles, oil writer and author of "The Greatest Gamblers," a story of the oil industry.

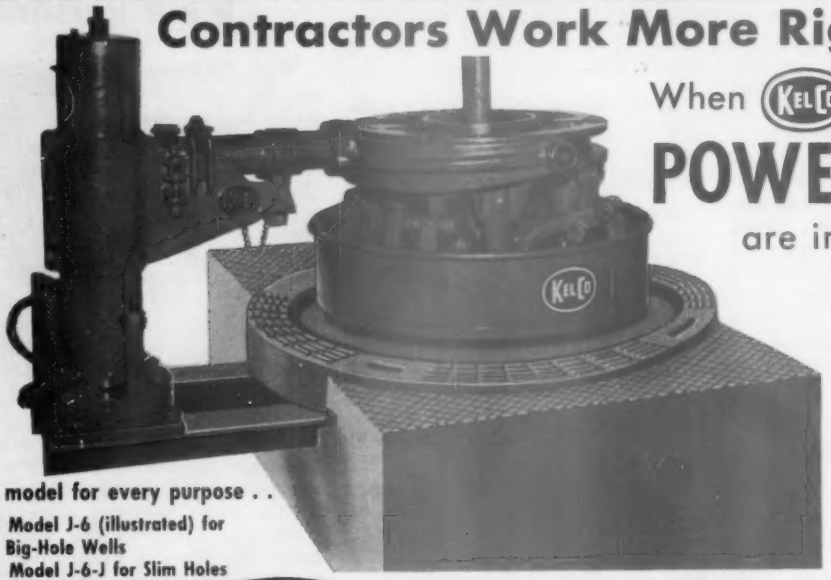
Dr. John T. Lonsdale, 64, University of Texas geology professor and Bureau of Economic Geology director since 1945, died October 5 at his home in Austin.

Loyd F. Worley, 42, founder of Worley & Harrell, Inc., Tulsa drilling firm, died October 9 at his home in Scottsdale, Ariz. Worley was with Foundation Oil Co. in Tulsa before Worley & Harrell was organized in 1951. He served as president of the drilling firm before selling his interest earlier this year.

George W. Artman, 64, Shawnee, Okla., independent, died October 7 in a Shawnee hospital. Artman was a geologist with Shell Oil Co. before setting up independent operations in 1930.

Pat O. Johnson, 49, Oklahoma City, general attorney for Kerr-McGee Oil Industries, Inc., died October 10 in an Oklahoma City hospital. He was injured in a fall a few days before his death and had been suffering from an arthritic condition for several years.

Contractors Work More Rigs Oftener



When KELCO air-operated

POWER SLIPS

are installed

KELCO slip bowls assure safety and straight pipe alignment

A model for every purpose . .

- **Model J-6 (illustrated) for Big-Hole Wells**
- **Model J-6-J for Slim Holes and Workover Jobs**

Available Through Your Preferred Supply Store

WRITE FOR FREE CATALOG AND PRICE LIST

Catheads
Power Slips
Tubing Tongs

BE SAFETY WISE
KELCO
KELCO-IZE

BEN F. KELLEY CO., INC.

18 South Madison
TULSA, OKLAHOMA

AUTOMATION

THIS IS IT!!

SURE it is! Now Odex has a completely transistorized control system for your lease automation project. Local and remote stations made up of fully transistorized equipment using Micro-wave, telephone lines, or existing service lines as carriers. Combine this with the "solid state components" . . . no mechanical parts to wear out . . . and you have absolute "trouble-free" control of your lease operation. Control that enables you to pin-point trouble, determine the cause, and dispatch the proper repairman immediately. No wasted time in machines or men.

These are just a few of the reasons why transistorized control means REAL AUTOMATION.

SEE THE LATEST INNOVATIONS IN AUTOMATION EQUIPMENT AT OUR EXHIBITS AT THE PERMIAN BASIN OIL SHOW . . . THIS WEEK—THURSDAY THROUGH SUNDAY . . . ODESSA, TEXAS

OUTSIDE BOOTHS 61—62—64

ODEX

ODEX ENGINEERING COMPANY

1410 N. Grant • Odessa, Texas • FEderal 7-3568

June-July oil figures were screwball

BY JOHN C. CASPER

DID THE OIL INDUSTRY show a gain in demand for July? Most people thought so until the Bureau of Mines Monthly Petroleum Statement came out last week. Now they are not quite sure.

Calculations, based on weekly refinery figures from American Petroleum Institute, showed total demand for the month at about 9,224,000 bbl. daily. Compared with July of last year, the current figures gave an increase of 2.9%. While that is only about half of the gain rate enjoyed by the oil industry for many years, it still could be called a respectable gain.

But that was before the Bureau of Mines issued its Monthly Petroleum Statement for July. The bureau calculated total demand for the month at 8,937,000 bbl. daily for a loss of 0.3% from the average for July 1959.

Whose figures are correct, API or the Bureau of Mines? These two reporting agencies often have minor differences in product stocks or refinery production. But, someone was way off for June and July.

Since there was so much difference between demand calculated from API figures and totals reported by the bureau, we have tabulated June and July figures for both agencies.

Take a look at the table for June. The month started with API and the bureau reporting stocks at about the same level. There was a difference of only about 424,000 bbl. The month ended with API stock figures about 6,170,000 bbl. ahead. API also reported almost 3,000,000 bbl. more production of major products. The net result of these variations was a difference in demand. The bureau reported 2,753,000 bbl. more for the month or about 91,000 bbl. daily.

For July the trend was in the opposite direction. The bureau started the month with its reported stocks 6,170,000 bbl. lower than the total published by API. By the end of the month it was 3,500,000 bbl. ahead. According to the bureau, product stocks increased 25,668,000 bbl. in July which was next to the highest July gain on record. API reported a gain of 16,036,000 bbl. This 9,600,000-bbl. difference in stock change accounted for almost all the variation in demand. Refinery production figures were only 650,000 bbl. apart.

The bureau report shows only 2.0% demand gain for the January-July period.

Supply and Demand, June 1960

(Thousands of barrels)

	Stocks 5-31	Ref. prod.	Outside blend	Imports	Transfers	Stocks 6-30	Total demand Th. bbl.	Total demand TBD
GASOLINE								
B of M	210,509	124,800	2,105	1,254	.....	198,452	140,216	4,674
API	210,406	125,674	2,105	1,254	.....	201,716	137,723	4,591
KEROSINE								
B of M	24,217	9,759	.....	.....	62	27,354	6,684	223
API	24,846	10,695	.....	.....	62	27,549	8,054	269
DISTILLATE								
B of M	95,461	53,338	.....	1,148	145	109,174	40,918	1,364
API	95,178	54,120	.....	1,148	145	111,722	38,869	1,296
RESIDUAL								
B of M	39,628	25,297	.....	17,098	350	41,074	41,299	1,377
API	39,809	25,700	.....	17,098	350	41,239	41,718	1,391
OTHER PROD.								
B of M	119,133	*45,549	.....	3,983	†7,188	116,779	59,074	1,969
API	119,133	*45,549	.....	3,983	†7,188	116,779	59,074	1,969
TOTAL								
B of M	488,948	*258,743	2,105	23,483	†7,745	492,833	288,191	9,606
API	489,372	*261,738	2,105	23,483	†7,745	499,005	285,438	9,515

Supply and Demand, July 1960

(Thousands of barrels)

	Stocks 6-30	Ref. prod.	Outside blend	Imports	Transfers	Stocks 7-31	Total demand Th. bbl.	Total demand TBD
GASOLINE								
B of M	198,452	131,522	1,963	1,037	.....	196,021	136,953	4,418
API	201,716	131,283	1,963	1,037	.....	193,390	142,609	4,600
KEROSINE								
B of M	27,354	11,164	.....	.....	74	30,499	8,093	261
API	27,549	11,405	.....	.....	74	30,184	8,754	282
DISTILLATE								
B of M	109,174	56,773	.....	796	136	131,044	35,835	1,156
API	111,722	56,755	.....	796	136	131,131	38,278	1,235
RESIDUAL								
B of M	41,074	26,265	.....	13,955	263	43,848	37,709	1,216
API	41,239	25,631	.....	13,955	263	43,227	37,861	1,221
OTHER PROD.								
B of M	116,779	46,480	.....	3,763	†8,549	117,109	58,462	1,886
API	116,779	46,480	.....	3,763	†8,549	117,109	58,462	1,886
TOTAL								
B of M	492,833	*272,204	1,963	19,551	†9,022	518,521	277,052	8,937
API	499,005	*271,554	1,963	19,551	†9,022	515,041	285,964	9,224

*Includes losses. †Includes crude exports and changes in unfinished stocks.

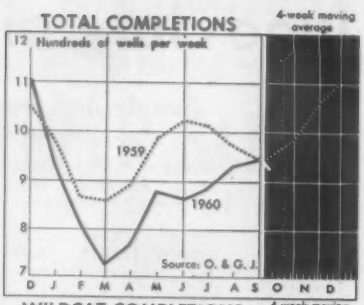
A quick look at the highlights . . .

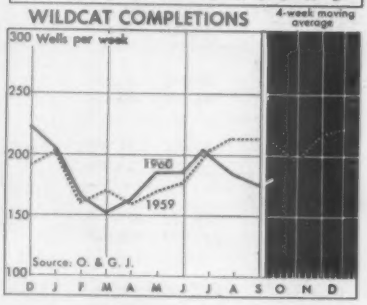
	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,814,110	DOWN	43,710	DOWN	66,666
Crude stocks	231,873,000	UP	1,511,000	DOWN	19,376,000
Completions	871	DOWN	75	DOWN	117
Refinery runs	7,880,000	DOWN	69,000	UP	192,000
Gasoline stocks	188,642,000	UP	1,225,000	UP	11,029,000
Kerosine stocks	35,121,000	DOWN	30,000	UP	2,307,000
Distillate stocks	171,437,000	UP	2,812,000	DOWN	6,233,000
Residual stocks	50,766,000	UP	441,000	DOWN	8,274,000
Four-product stocks	445,966,000	UP	4,448,000	DOWN	1,171,000
Total imports	1,571,000	UP	303,900	UP	235,900

Active Rotary Rigs

	10-10-60	10-3-60	10-12-59
Alabama	2	2	6
Alaska	7	7	(†)
Arkansas	12	10	15
Arizona	2	1	1
California	69	75	83
Land	67	72	77
Offshore	2	3	6
Colorado	59	49	57
Florida	3	3	3
Land	2	2	2
Offshore	1	1	1
Georgia	1	1	0
Illinois	48	47	41
Indiana	10	10	10
Iowa	1	1	0
Kansas	110	114	126
Kentucky	7	7	12
Louisiana	288	295	329
North	28	31	50
S. Inland waters	120	123	108
S. Land	84	81	113
Offshore	56	60	58
Maryland	0	0	0
Michigan	35	35	36
Mississippi	62	61	73
Missouri	1	1	0
Montana	24	24	25
Nebraska	28	21	25
Nevada	0	0	1
New Mexico	106	95	113
New York	2	2	0
North Dakota	15	14	23
Ohio	5	6	5
Oklahoma	179	168	193
Oregon	1	1	0
Pennsylvania	9	8	12
South Dakota	1	1	8
Texas	597	595	717
S. Inland waters	8	5	3
S. Land	154	157	190
Offshore	1	1	0
North	47	39	175
Panhandle	45	49	(*)
East	55	69	(*)
West Central	169	162	204
West	118	113	145
Utah	25	23	31
Washington	1	1	2
West Virginia	6	6	7
Wyoming	74	73	88
Total U. S.	1,789	1,757	2,042
Western Canada	159	147	184
Eastern Canada	0	0	1
Grand Total	1,948	1,904	2,227

Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60.

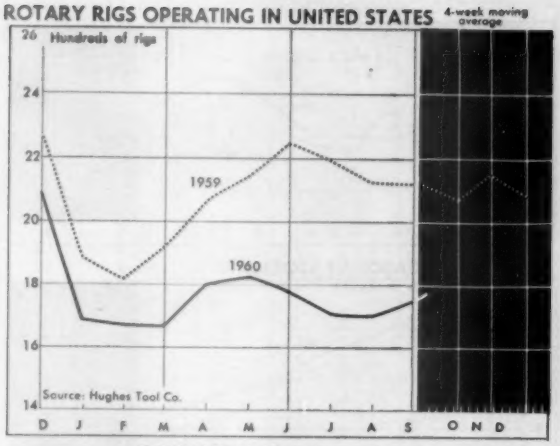




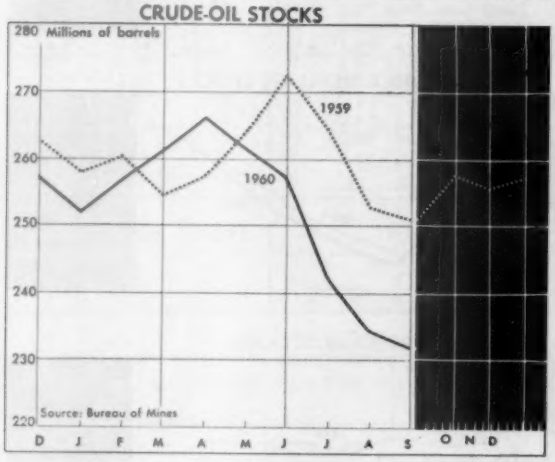
WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 8, 1960

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	3	3	0	0	0	0	34,470	36	77	0	0	0	0	0	2	20
Arizona	0	0	0	0	0	0	0	28	22	0	0	0	0	0	18	20
Arkansas	16	7	0	0	9	0	49,498	461	655	4	0	0	0	4	124	115
California	38	29	0	2	7	0	129,271	1,264	1,180	7	1	0	1	5	241	310
Colorado	12	0	0	3	9	0	72,444	488	591	9	0	0	1	8	249	349
Illinois	38	12	0	0	17	9	87,042	1,744	1,761	8	2	0	0	6	366	288
Indiana	26	7	0	0	18	1	29,995	809	636	13	1	0	1	12	298	217
Kansas	96	46	0	8	38	4	287,204	2,995	3,080	22	0	0	3	19	809	789
Kentucky	11	7	0	0	4	0	10,740	1,561	1,877	3	2	0	0	1	138	221
Louisiana	80	43	5	1	31	0	559,498	2,736	2,899	9	2	0	0	7	416	388
North	37	16	0	1	20	0	134,231	1,036	1,121	8	2	0	0	6	203	173
South	35	23	3	0	9	0	342,095	1,318	1,461	1	0	0	0	1	188	200
Offshore	8	4	2	0	2	0	83,172	382	317	0	0	0	0	0	25	15
Michigan	25	11	0	1	13	0	84,402	716	498	2	0	0	0	2	187	129
Mississippi	13	5	1	1	6	0	125,162	528	493	5	0	0	1	4	202	220
Montana	12	4	0	0	8	0	40,672	249	245	6	0	0	0	6	117	79
Nebraska	20	5	0	0	15	0	107,586	670	704	13	0	0	0	13	279	303
New Mexico	35	21	0	7	7	0	153,434	1,440	1,609	1	0	0	0	1	212	188
West	15	4	0	7	4	0	82,228	504	724	1	0	0	0	1	59	50
East	20	17	0	0	3	0	71,206	936	855	0	0	0	0	0	153	138
New York	8	0	0	6	2	0	24,908	258	217	5	0	0	3	2	38	19
North Dakota	1	1	0	0	0	0	6,747	226	361	0	0	0	0	0	60	67
Ohio	22	8	0	7	5	2	58,194	821	786	1	0	0	0	1	39	23
Oklahoma	59	34	0	3	17	5	241,094	3,513	4,400	12	4	0	0	8	565	674
Pennsylvania	0	0	0	0	0	0	0	519	392	0	0	0	0	0	10	10
South Dakota	0	0	0	0	0	0	0	19	12	0	0	0	0	0	8	4
Texas	316	164	15	17	109	11	1,303,207	12,082	14,646	62	0	1	1	52	2,475	2,756
Dist. 1	40	16	2	1	21	0	110,170	852	836	16	0	0	0	16	319	250
Dist. 2	12	2	2	2	6	0	86,343	588	615	6	0	0	1	5	149	177
Dist. 3	24	13	2	0	9	0	180,039	914	934	3	1	0	0	2	170	185
Dist. 4	23	7	3	4	9	0	122,674	834	1,056	6	0	1	0	5	233	263
East	23	15	0	1	6	1	87,096	986	972	4	0	0	0	4	201	187
Dist. 7-B	37	16	0	1	19	1	125,856	1,756	2,009	11	2	0	0	9	498	539
West	82	58	1	3	15	5	367,232	3,148	4,457	9	2	0	0	7	482	609
Dist. 9	55	32	1	0	18	4	141,213	2,219	2,755	7	3	0	0	4	379	462
Dist. 10	20	5	4	5	6	0	82,584	785	1,012	0	0	0	0	0	44	84
Utah	5	0	0	0	5	0	27,347	181	237	5	0	0	0	5	67	63
West Virginia	16	1	0	12	3	0	45,879	634	611	0	0	0	0	0	6	25
Wyoming	18	12	0	2	4	0	101,933	794	751	4	1	0	0	3	321	261
Misc. (Alaska)	1	0	0	1	0	0	14,019	115	79	1	0	0	1	0	105	52
Total U. S.	871	420	21	71	327	32	3,594,746	34,887	38,819	192	21	1	11	159	7,352	7,590
Previous week	946	376	23	71	420	56	3,373,166	.....	.....	199	21	0	9	169	.....	.....
Cum. 1960	34,887	15,776	1,013	2,885	13,305	1,908	145,620,415	.....	.....	7,352	655	79	255	6,363	.....	.....
Cum. 1959	38,819	19,292	953	2,871	14,603	1,100	161,713,738	.....	.....	7,590	691	91	244	6,564	.....	.....
Western Canada	45	31	0	8	6	0	262,689	1,785	1,904	12	3	0	3	6	468	536

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	10-1-60	9-24-60	10-3-59
Pennsylvania	2,356	2,360	2,625
Other Appalachian	1,328	1,443	2,108
Illinois, Indiana, Michigan	8,756	8,857	9,342
Nebraska and North Dakota	2,710	2,885	2,926
Kansas	8,321	8,502	9,988
Oklahoma	15,116	15,345	13,906
Arkansas	1,819	1,845	2,190
Louisiana	18,424	17,815	17,852
North	2,981	3,019	3,456
South	15,443	14,796	14,387
Mississippi, Alabama, Florida	1,762	1,735	2,264
New Mexico	8,426	8,182	7,824
Texas	97,554	96,428	109,688
East Texas	7,434	7,366	8,412
West Texas	47,913	46,609	49,690
Texas Gulf	16,488	16,476	19,368
Other Texas	25,719	25,977	32,218
Wyoming	15,602	15,930	16,140
Other Rocky Mountain	8,942	9,161	9,179
California	26,630	26,585	29,536
Foreign	†14,127	13,289	15,681
Totals	**231,873**	230,362	251,249

*Bureau of Mines. †Includes 4,315,000 bbl. in California.

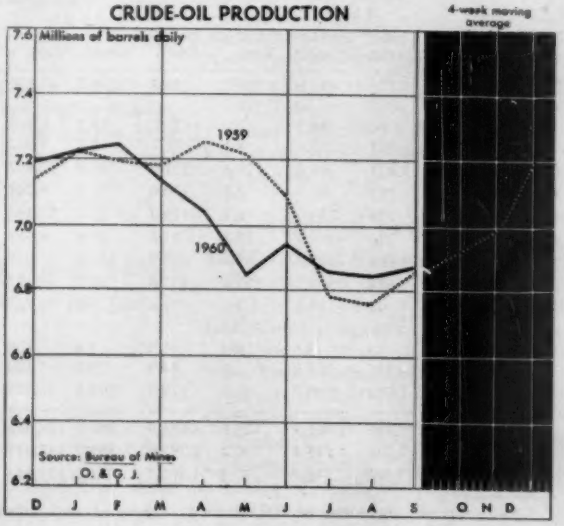
DAILY AVERAGE PRODUCTION FOR WEEK

	October 8, 1960			Oct. 1
	Crude oil	Lease condensate	Total	total
Alabama	21,300	.....	21,300	21,500
Arkansas	77,375	200	77,575	77,500
California	829,300	.....	829,300	829,000
Colorado	131,400	.....	131,400	130,500
Eastern	41,200	.....	41,200	39,600
Florida	1,000	.....	1,000	900
Illinois	213,600	.....	213,600	220,700
Indiana	31,100	.....	31,100	31,900
Kansas	†301,635	.....	†301,635	†297,920
Kentucky	56,900	.....	56,900	60,000
Louisiana	945,550	125,600	1,071,150	1,074,800
North	104,550	5,850	110,400	110,300
South	841,000	119,750	960,250	964,500
Michigan	41,900	.....	41,900	42,000
Mississippi	134,000	3,800	137,800	135,550
Montana	82,500	.....	82,500	81,700
Nebraska	69,100	.....	69,100	68,000
Nevada	100	.....	100	100
New Mexico	285,000	8,700	293,700	295,500
North Dakota	60,700	.....	60,700	61,500
Oklahoma	†479,300	.....	†479,300	†473,700
Texas	2,331,000	82,575	2,413,575	2,461,500
Dist. 1	43,000	2,500	45,500	44,500
Dist. 2	97,000	8,100	105,100	106,000
Dist. 3	297,000	36,500	333,500	342,000
Dist. 4	169,000	11,900	180,900	183,200
Dist. 5	25,000	300	25,300	26,300
Dist. 6	101,000	10,000	111,000	118,800
East Texas field	121,000	.....	121,000	124,000
Dist. 7-B	121,000	150	121,150	129,125
Dist. 7-C	114,000	3,050	117,050	116,050
Dist. 8	948,000	7,500	955,500	967,000
Dist. 9	194,000	1,650	195,650	196,600
Dist. 10	101,000	925	101,925	107,925
Utah	98,700	.....	98,700	94,300
Wyoming	358,900	.....	358,900	358,000
Others	‡1,675	.....	‡1,675	‡1,650
Total U. S.	6,593,235	220,875	**6,814,110**	6,857,820
Change from previous week, down			**43,710**	
Canada	†472,000	.....	†472,000	†525,700

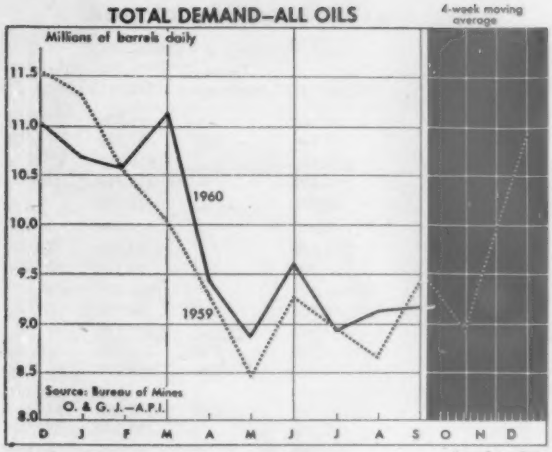
Total U. S. production—Jan. 1-Oct. 8 ..... 1,972,613,400 bbl.
Same period last year (crude plus cond.) .... *1,982,966,600 bbl.

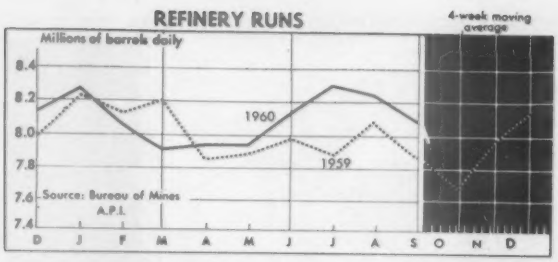
*Includes 52,524,100 bbl. condensate. †Week ended previous Monday. ‡Alaska, South Dakota, and Arizona.

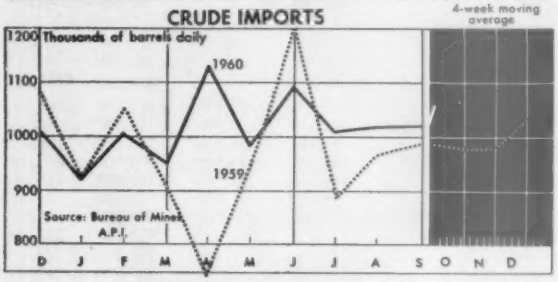
CRUDE-OIL PRODUCTION

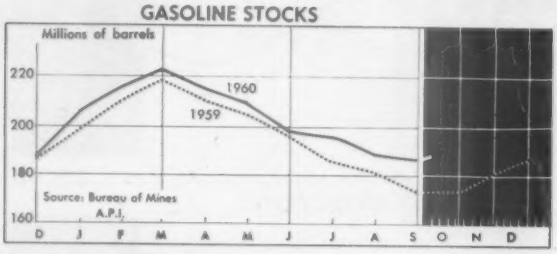


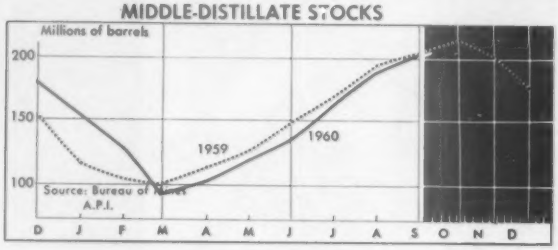
REFINING

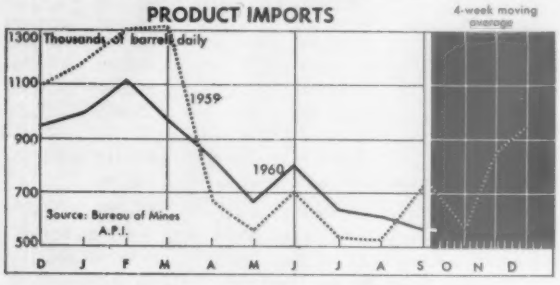


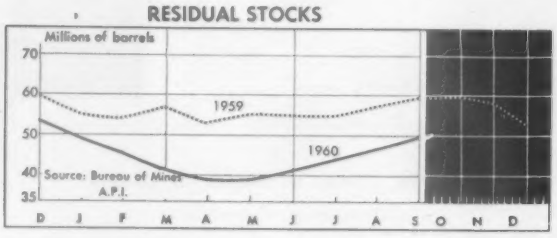












API REFINERY REPORT—OCTOBER 7, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,126	492.9	38.2	299.8	134.7	43,657	14,141	65,888	13,139	1,051	469.7	21.3	325.0	150.0
Appalachian:														
District 1	94	44.3	1.0	20.6	14.4	6,105	772	4,305	511	91	39.3	2.5	20.0	9.0
District 2	109	53.4	4.1	21.7	12.7	2,971	527	1,850	330	104	51.3	5.8	17.9	8.8
Ind., Ill., Ky.	1,421	761.4	70.6	291.4	143.9	32,527	7,150	30,748	6,395	1,421	739.2	64.0	311.8	134.5
Minn., Wis., Dak.	97	41.7	0.7	30.0	21.7	6,044	1,613	8,523	639	71	31.2	0.8	14.9	11.3
Okla., Kans., Mo.	729	399.2	6.1	179.7	25.9	17,454	1,709	14,388	1,009	688	385.6	16.2	170.2	24.1
Inland Texas	292	219.7	12.2	41.6	19.4	6,614	649	1,679	2,557	287	212.4	9.1	48.7	18.2
Texas Gulf Coast	1,864	911.0	87.4	453.7	124.0	25,033	3,620	17,405	6,258	1,718	910.3	102.5	412.0	143.6
La. Gulf Coast	678	338.2	77.0	137.6	40.7	10,552	1,887	6,464	1,464	693	378.5	55.3	150.1	54.6
N. La. and Ark.	99	57.1	3.6	21.4	5.9	5,563	1,268	2,704	140	67	25.8	2.2	17.9	5.3
Rocky Mtn.:														
New Mexico	13	8.1	0.4	2.3	1.6	608	43	156	30	27	14.7	0.5	5.3	2.8
Other	284	134.2	3.0	64.9	29.4	5,139	365	3,026	1,127	277	135.2	2.6	60.9	32.1
West Coast	1,074	500.7	19.7	129.3	272.8	26,375	1,377	14,301	17,167	1,152	507.1	3.8	181.3	275.0
Oct. 7, 1960	7,880	3,961.9	324.0	1,694.0	847.1	188,642	35,121	171,437	50,766	7,647	3,900.3	286.6	1,736.0	869.3
Sept. 30, 1960	7,949	4,145.4	380.4	1,797.6	881.1	187,417	35,151	168,625	50,325	.....	.....	.....	.....	.....
Oct. 9, 1959	7,688	3,946.4	281.6	1,801.7	791.0	177,613	32,814	177,670	59,040	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.05-3.25
- Conroe 3.23-3.53
- Van 3.08

Pennsylvania Grade:
- Bradford $4.75-4.80
- Middle District 4.52
- Southwest Pennsylvania 4.25
- West Virginia 4.17
- Buckeye Grade 4.08

Illinois Basin **3.00-3.05**

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
- Arabian, 34.0°-34.9°, Ras Tanura $1.80
- Iranian, 34.0°-34.9°, Bandar Mashur 1.78
- Iranian, 34.0°-34.9°, Abadan 1.73
- Iraq, 35.0°-35.9°, Fao 1.72
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.59
- Qata, 41.0°-41.9°, Umm Said 1.95

Middle East, E. Mediterranean:
- Arabian, 34.0°-34.9°, Sidon $2.17
- Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli 2.19

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 36° 2.42

Canada:
- Leduc-Woodbend $2.53
- Redwater (Alta.) 2.42
- Smiley (Sask.) 2.18
- Pembina 2.38

Venezuela:
- Cumbarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0°-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)
- Gulf-NY, clean (ATRS—5%) $2.71
- Carib.-NY, dirty (ATRS—50%) 1.43
- PG-Italy, dirty (Scale—40%) (27s. 8d.) 3.87
- PG-Japan, dirty (USMC—60%) 4.08

★ Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):
- Regular (91 octane) .. $12.25-12.50
- Premium (99 octane) .. 15.00-15.25
- Natural gasoline (26-70) 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) .. 11.00
- Regular (92 octane) .. 11.25
- Premium (98 octane) .. 12.25

California (rack) Los Angeles:
- Regular (88 octane) .. 11.65-12.15
- Premium (94 octane) .. 12.65-13.15
- Premium (100 octane) 14.00-14.65

Caribbean area (cargoes):
- Regular (87 octane) .. 10.125-10.25
- Premium (97 octane) .. 11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):
- Kerosine 42-44 .... 10.125-10.375
- Diesel oil (58 d.i. and above) 9.75-10.00
- Distillate No. 1 ..... 9.75-10.00
- Distillate No. 2 ..... 8.75- 9.00

Gulf Coast (cargoes):
- Kerosine 41-43 ..... 9.00- 9.25
- Distillate No. 2 ..... 8.25

New York Harbor (barges):
- Kerosine 41-43 ..... 10.45
- Distillate No. 2 ..... 9.45
- Diesel fuel, 48-52 d.i. 9.65

Caribbean area (cargoes):
- Distillate No. 2 ..... 8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):
- Residual fuel (max. 1% S) $1.90

Gulf Coast (cargoes):
- Bunker C fuel 2.30

New York Harbor (barges):
- Bunker C fuel 2.52

Caribbean (cargoes):
- Bunker C 2.10

California (rack):
- Bunker C fuel, Los Angeles 2.25

CLASSIFIED ADVERTISING

. . . your market place

for the oil and gas industry

RATES:
UNDISPLAYED CLASSIFIED 30c a word per issue. 10% discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in advance.

DISPLAY CLASSIFIED
$20.00 a column inch one issue . . .
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal P. O. Box 1260, Tulsa 1, Okla.

EXCEPT . . .

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona) Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone AXminister 2-0287.

FOR SALE EQUIPMENT

SALES AND RENTALS. New or used portable floating bridges, trestle bridges and ferrys. Bub Gallaway, 4106 Ascot Lane, Houston, Texas. Phone OV 2-2334.

DOUBLE DRUM Unit w/spudder for servicing and workovers. Excellent condition. Now working. Box 736 Great Bend, Kansas. GLadstone 3-8817.

TRAILER MOUNTED 55 Failing Rotary, Low Boy mounted 5 x 10 pump new 10 inch Table, Truck and trailer complete except Drill Pipe. L. C. McLaughlin Drilling Co., 610 East 61st Street North, Wichita, Kansas, Telephone SH 4-1232.

FRANKS

Improved Model 7000 single drum workover unit, complete with telescoping derrick, mounted on 6 x 6 FWD truck.

For sale by sealed bids.

For additional information, call or write:

SOHIO PETROLEUM COMPANY
WEHLU, Route 1, Box 142
Edmond, Oklahoma
Phone Edmond 1080
Oklahoma City, VIctor 2-5343

FOR SALE EQUIPMENT

CLARK GAS Compressor Model MA-4 (8¼ x 8¼) Two Stage 25#—800#, complete with steel Fabricated House. Located Driscoll, Texas. $12,500.00. Spartan Well Service, 207 Sun-Texaco Bldg., Corpus Christi, Texas. Phone TU-37869.

THE FOLLOWING for sale to highest bidder on where is, as is basis: One 1957 R-194, International Oilfield Truck, fully equipped. One 1958 Model-555A, GMC Oilfield Truck, fully equipped. One 1952 Nabors 26-Ft. Tandem Laydown Float. One 1955 Nabors Tandem Pole Trailer. One 1952 Nabors 28-Ft. Tandem Laydown Float. One Re-built Tandem Pole Trailer w/Neway Unit. Descriptive list will be mailed with bidding instructions upon request. All bids must be mailed to Shell Oil Co., P. O. Box 1509, Midland Texas, and Postmarked not later than Oct. 24th.

—PIPE—

2,000,000 ft.	2"	3.50# to the ft.
1,000,000 ft.	3"	7.70#
1,000,000 ft.	4"	10.98#
500,000 ft.	6"	19.80#
200,000 ft.	8 5/8"	28#
400,000 ft.	10¾"	35#
75,000 ft.	12¾"	40#
50,000 ft.	18"	59#

All No. 1 Grade Plain end and cleaned.
INDIANA-OHIO PIPE CO.
P. O. Box 5412 Shop. Sta.
Columbus 19, Ohio
Phone CL 3-5527

FOR SALE EQUIPMENT

3 ROTARIES, ALSO, 83—72—71 Speedstars. Star Drilling Supply Company, P. O. Drawer 151, Chanute, Kansas.

5,000 GAL. RUBBER lined tank and stand 1550 C Gaso Pump, Bronze Trim, Central Acid Service, Inc., Box 774, McPherson, Kansas. Phone CHapel 1-3865.

MECO WATER DISTILLATION UNIT
Unused Model 300K Unit complete, located at Alta Loma, Texas (near Houston)—Price $10,000.00 Overseas Drilling Company, 700 Mercantile Bank Building, Dallas, Texas—Phone: RI 1-3561.

FOR SALE: by Rimrock Tidelands, Inc. Two Wells and Tank Battery complete with all equipment, Tennessee Colony Field, Anderson County, Texas. For further information, call or write: E. S. Doyle, P. O. Box 896, New Orleans 2, Louisiana.

LIQUIDATION AT ESSO STANDARD OIL REFINERY, BATON ROUGE
400 HP Compressors; Towers; Vessels; Heat Exchangers; Pumps.

For further information contact:

Chemical & Refinery Equipment Co.
Box 19351, Houston, Texas
Phone HO 8-1317

OR

Louisiana Steel Compress Co.
Box 566, Baton Rouge, La.
Phone DI 8-5371

FINAL CLEAN-UP SALE

DESTREHAN, LA.

HEAT EXCHANGERS

Steel Tube: 3280, 2100, 1200, 950 sq. ft.
Adm. Tube: 2800, 2700, 2600, 2100, 1700, 1500 1375, 1250, 1100, 1000, 920, 650 sq. ft.
20 Fin Tubes: 50-190 sq. ft.

VESSELS & TOWERS

8' x 73' 20 Tray 25#
7½' x 56' 20 Tray 35#
3' x 58' 30 Tray 154#
3' x 47' 20 Tray 120#
18" x 32' 15 Tray 130#
2' x 30' packed 50#
4' x 36' packed 210#
10' x 55' 60#
8' x 43' 60#
6' x 42' 200#
6' x 20' 40#
12' x 43' 25#

PUMPS

Hot Oil: 1"-6"; 50-400 gpm 100-3,000 ft. hd.
Boiler Feed: 190 gpm 1,500' hd.
Cooling Tower: 7,000 gpm 120' hd.
River Water Sump: 1,000 gpm 59' hd.

STORAGE TANKS & SPHERES

15 Storage Tanks welded: 29,000, 10,000, 5,000, 3,750 barrel.
5 Spheres-Spheroids: 5,000, 10,000 barrel.

1—Carrier 1,000 ton refrigeration Compressor Turbine drive. (1953)
2—IR Turbo Exhausters 15,300 & 17,000 CFM 4.85 PSIG with Turbine Drives.
1—Clark Centrifugal Compressor 10,000 CFM—240 PSI discharge. (1953)

OTHER FEATURED ITEMS

1 Lummus: 35 mil. BTU furnace
2 Petro-Chem. Furnace: 1¼ mil. & 8 mil. BTU
2 B&W Boilers: 70,000# per hr.-450#
1 IR-XVG-4 Compressor
1 Worth LT-6 Compressor

WIRE!—PHONE! FOR COMPLETE INFORMATION

BRILL

EQUIPMENT COMPANY—DESTREHAN, LA.—NORCO 6571
4101 San Jacinto St. Houston 4, Texas, JA 6-1351
35-65 Jabez St. Newark 5, N. J., MA 3-7420

LAST CALL LIQUIDATION

at ESSO REFINERY Balto., Md.

The Last Roundup 60 DAYS TO GO

CHOICE EQUIPMENT STILL AVAILABLE all sizes and types

- TOWERS—VESSELS
- EXCHANGERS
- PUMPS
- CONDENSERS
- BLOWERS
- TRANSFORMERS
- INSTRUMENTS
- MOTORS, etc.

SAVE DOLLARS NOW Phone or Wire COLLECT

N. Y. Phone—MUrray Hill 7-5280
Tulsa Phone—Diamond 3-4890
Baltimore Phone—Dickens 2-0224

HEAT & POWER CO. INC.
60 East 42nd St., New York 17, N.Y.
310 Thompson Bldg., Tulsa 3, Okla.
Box 5203, Baltimore 24, Maryland

FOR SALE EQUIPMENT

NEW 11—Part 1FXF255 Eccentric Gears For 4 x 5 Gardner Denver Pump. 95.00 each Halloran Equipment Co., 5702 Harvey Wilson Drive, Houston 20, Texas.

ROTARIES, SPUDDERS, Core Drills. Tank mounted service trucks. New & Used equipment. Complete supplies. Money-saving prices. Nation-wide service. If you want to buy or sell, contact: Pressey & Son, Pueblo, Colorado.

LUFKIN 74" STROKE PUMPING UNIT

228,000# Peak Torque—Single Reduction
6,000' 7" OD Casing, 24# Seamless R-2 10V thd.
5,280' 3" OD 7.57# Beveled Line Pipe
6 & 10 Ton YALE Triplex Spur-Geared Chain Hoists
300 sq. Ft. Steel U-Tube Reboiler

HEAT & POWER CO., INC.
310 Thompson Building, Tulsa 3, Okla.

10,000-BARREL TANK

1—10,000-bbl. Pontoon Floating Roof Tank, 42'-6" dia. x 40' high, welded construction. Used for Gasoline Storage, excellent condition. Located: Bishop, Texas.

MID-STATES PIPE AND SUPPLY CO.
703 Philtower Bldg. LUther 2-9128
Tulsa, Oklahoma

FOR SALE:

1 Complete kitchen trailer
1 Dining trailer
2 Shower and toilet trailers
6 Bunk trailers
1 Superintendent trailer
1 Small storage trailer

Nine of the trailers are SPARTAN—all metal. The others are standard house trailers. In excellent condition ready for use. **Contact:**

Box M-129, The Oil and Gas Journal
Tulsa, Oklahoma

PUMPING UNITS

American 109,000# P.T. 54" stroke D.R.
Emsco 114,000# P.T. 64" stroke D.R.
Lufkin 160,000# P.T. 64" stroke D.R.
National 160,000# P.T. 54" stroke D.R.
Bethlehem 160,000# P.T. 64" stroke D.R.
Bethlehem 160,000# P.T. 74" stroke D.R.
Emsco 228,000# P.T. 74" stroke D.R.
Other units available

25 HP 1,160 RPM Electric pumping motors
503 F.&M. engines, complete
4' x 21' B.S.&B. treater, 25# W.P.
3' x 13' National 125# separators
5/8" and 3/4" sucker rods
Also much unlisted equipment

All equipment in good condition, prices reduced for immediate sale. Call collect:

WOODFORD SUPPLY COMPANY
CE 5-1454, Oklahoma City, Okla.

FOR SALE EQUIPMENT

PETRO-CHEM ISO-FLOW FURNACES
with STAINLESS CONE & TIP
9MM BTU/HR. Duty; 20' Stack
7MM BTU/HR. Duty; 44' Stack
2MM BTU/HR. Duty; 36' Stack
HEAT & POWER CO., INC.
60 East 42nd Street; New York 17, N. Y.
310 Thompson Building; Tulsa 3, Okla.

EQUIPMENT WANTED

WANTED—power pipe straightener, portable 3" and 4". Indiana-Ohio Pipe Co. P. O. Box 5462 Shep. sta., Columbus 19, Ohio.

SMALL ONE AND TWO drum Winches, also, 72-71 Speedstars; 60, 24, 22 Bucyrus and Rotaries comparable to 1500 Failing and 1000 Mayhew. Star Drilling Supply Company, P. O. Drawer 151, Chanute, Kansas.

FOREIGN—DOMESTIC Employment Oil, Chemical, Industrial. Write for details without obligation. Accredited Personnel Services, P. O. Box 6006, New Orleans 14, La.

200 TON HORIZONTAL Wheel Press with Minimum of 48" between bars. The Buckeye Supply Company, 18 Harrison Street, Zanesville, Ohio.

HELP WANTED

DRILLING OR Mechanical Engineers 2 to 8 years experience. Global Marine Exploration Co., 650 So. Grand, Los Angeles 17, Calif.

CHEMICAL ENGINEER OR CHEMIST

PhD in Chemical Engineering or Chemistry, preferably with petroleum refining experience. To supervise two laboratories having 30 employeees. Also to engage in Quality Control and act as consultant on purchasing of aromatic oil.
Rapidly expanding corporation with excellent advancement opportunities. Send resume stating education, experience starting salary expected and include snapshot. All replies kept confidential.

Box M-130, The Oil and Gas Journal
Tulsa, Oklahoma

OIL FIELD RUBBER PRODUCTS

Engineer or Technician

Excellent opportunity for man experienced in molded rubber products development. Must have good working knowledge of oil industry. Will work in Sales Department as Liaison Engineer between customer and factory.

To work out of new plant in Fort Smith, Arkansas, servicing South Western area.

Salary comensurate with experience. All replies will be held in strict confidence. Send complete resume to:

Mr. M. E. Badstuber
OHIO RUBBER COMPANY
Div. of Ealge-Picher Co.
Willoughby, Ohio

HELP WANTED

WANTED: DRILLERS to operate Bucyrus-Erie Spudders 22W-60Ls. 6 inch through 36 inch wells water wells 200 to 1,500 feet deep. Drive casing and drilling. Sand & Rock. Florida territory. Complete Resume' of drilling experience. References required. If interested in permanent employment with opportunity of advancement contact us immediately. Meridith Corporation, P. O. Box 470, Orlando, Fla.

ENGINEER: EXPERIENCED in economic studies and design of crude and products pipe lines and stations for general engineering and operating duties. Midwestern location. Box M-133, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide. $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma.

ENGINEERS AND Accountants wanted immediately by Federal Power Commission, Washington, D. C., and other locations. Regulatory experience desirable but not essential. Salary range $4345-$8955. Civil Service positions. Write Director of Personnel, Federal Power Commission, Washington 25, D. C.

CHALLENGING POSITION with consulting firm for well completion and production specialist. Excellent growth possibilities for right man. Must be graduate engineer, 35-50 years of age, with some managerial experience. Job location in France, for minimum of 2 years. Ability to read and speak French very desirable. Salary commensurate with ability. Give full particulars in first letter, including experience record, references, and availability. Box M-125, The Oil and Gas Journal, Tulsa, Oklahoma.

IMMEDIATE OPENING
FOR PRODUCTION SUPERINTENDENT

Independent oil company requires Production Superintendent, Bolivia, South America. Will have complete technical responsibilities on completion, producing, and LTE plant operation. Excellent opportunity in challenging job for qualified man. PE degree and minimum five years' field experience preferred. Age to 45. Family housing available. Contact:

Personnel Department
BIG CHIEF DRILLING COMPANY
Box 8837, Oklahoma City 14, Oklahoma

Sales Technical Service

Opportunity for experienced Ch. E's or Chemists with sales or technical background to join new chemical producer. We want technically trained men with fuels and/or TEL experience for oil company contact and service work. Of interest also are those with similar business experience, but different educational background.

Write: **O. Fremd**
HOUSTON CHEMICAL CORP.
200 Madison Ave., NYC, N. Y.

SITUATIONS WANTED

SUBSURFACE GEOLOGIST, 6 years experience Gulf Coast, Venezuela, married, consider any position or location. Box M-131, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER-SUPERINTENDENT desires employment in any capacity. Salary not important consideration. Fifteen years experience, registered professional engineer two states. Resume on request. Box M-128, The Oil and Gas Journal, Tulsa, Oklahoma.

PILOT 37 AVAILABLE for domestic or foreign employment. Reliable and experienced with 2,000 hours helicopters, 2,700 fixed-wing. For resume write: Box M-132, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

LICENSED CHEMICAL Engineer—MS—age 49, 23 years refinery experience including process engineering and supervision of analytical and research laboratories. Now in foreign job. Prefers domestic supervisory position but will consider foreign service. Box M-122, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PETROLEUM ENGINEER. Wide experience in well completion, drilling, leasing, reserve estimates and property management in Ohio. Would like position with responsible company to supervise drilling, completion and manage properties in Ohio. Box M-135, The Oil and Gas Journal, Tulsa, Oklahoma.

DISTRIBUTORS WANTED

WANTED

Established companies, dealing with oil production, to distribute complete line of scale inhibitors and emulsification chemicals.

Box 31 R 869, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

REAL ESTATE

LARGE OFFICE SUITE AVAILABLE
DENVER, COLORADO

For lease, 4,800 square feet in Patterson Building, center of best Denver Downtown Business Area. Ideal setup containing 16 private offices (most are carpeted), plus filing, clerical and reception areas. Air conditioned throughout. Reasonable rent.

Contact Post Office Box 1877, Midland, Texas, MUtual 3-2734 or Mr. Cass, Van Schaack and Company, 624 17th Street, Denver, Colorado, MAin 3-9333.

REAL ESTATE

4,000 SQUARE FEET offices and open space. Fireproof one story building near downtown Tulsa and Major Companies. Paved parking: central air and heat: fluorescent lighting. Robert R. Ward—216 Hazel Boulevard, Tulsa.

FIELD RECORDS WANTED

WANTED: GEOLOGICAL file on North Central Oklahoma. E-logs, sample logs, scout tickets. Contact: McClung, c/o W. H. Pine, Okmulgee, Oklahoma.

FINANCIAL SERVICE

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

BUSINESS SERVICE

DELAWARE CORPORATIONS formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

DISTRIBUTORS WANTED

WANTED

Established companies, to distribute complete line of fuel oil additives in the Mid-Continent and Southern areas.

Box 31 R 868, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

PRODUCTION WANTED

AN INDIVIDUAL desires to buy 75 to 100 barrels per day of good settled production. Will pay the highest price, all cash. Please write to Milton Gessner, Laconia Building, Wheeling, W. Va.

WANTED: GAS OR Waterflood Royalties only, Texas, N.M., Okla. Don't reply unless with complete engineering: Production record, core-analysis reserves, geology, telling flood history, Box 4803; Midland, Texas.

BUSINESS OPPORTUNITIES

SOMEBODY RELIABLE, drill well 3,000 ft., St. Peters sand. will give 700 acres lease, 2 years at 25 cents per acre, per year and carry me 1/8 over riding royalty in all leases. In Vermillion County, Illinois. Good geology reports, to open a new oil or gas pool. Write or phone Myrtle Leak, 511 North Hazel St., Danville, or HI 6-4054.

OILFIELD PRODUCTION equipment manufacturer has several choice areas open on exclusive distributorship basis. Write to P. O. Box 7288, Houston 8, Texas, or visit Booth B-27 and B-28 at Permian Basin Oil Show.

I OWN AND am going to sell Geological Library, over 1,300 surface maps covering Oklahoma. Opportunities unlimited as basis for exploration by and development of a new company. Box M-109, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW JOURNAL MANUALS

You will want one or more of these recently released technical manuals for your working library.

A. FLOW CALCULATIONS . . .
for the pipeline engineer. Crude-oil, products, and natural gas pipelines.

B. PROCESS COST-IMATING
Part 1 of W. L. Nelson's series on estimating operating costs.

C. PROCESS INSTRUMENTATION-AUTOMATION
Instrumentation and process control, including the use of analyzers, loggers, and computers.

D. DRILLER'S HANDBOOK NO. 1
Featuring the drilling line, the drill string, mud pumps, blowout prevention.

E. DRILLER'S HANDBOOK NO. 2
Drawworks and transmission, blowout preventor testing, lost circulation materials and others.

F. FORMATION FRACTURING
Discussion of the latest fracturing techniques.

G. FUNDAMENTALS OF ELECTRIC LOGGING
Introduction, measurement, interpretation and use of electric logs.

H. HANDBOOK OF MODERN SECONDARY RECOVERY METHODS
Covers waterflooding, thermal methods, gas injection, and miscible-phase flooding.

EACH $1.50

A service charge of 25 cents will be made on all orders which total less than $5.00.

Clip the coupon and send it with your payment.

Please send me manuals Nos. .....
To:
Name .....
Address .....
City & State .....
I am enclosing $ .....

Reader Service Department
THE OIL AND GAS JOURNAL
P. O. Box 1260 **Tulsa, Okla.**

LEASE AND DRILLING BLOCKS

EASTERN KANSAS 155 acres four proven locations Bartlesville Sand Production 1,200 ft deep. Offsetting large flood. 5/16ths for sale $400.00 per 1/16th to drill No. 1. Box M-116, The Oil and Gas Journal, Tulsa, Oklahoma.

NEED ADDITIONAL capital to drill to Bartlesville Sand in Montgomery County, Kansas. Proven area. All funds escrowed. $500.00 per ⅛ interest. Write S & M Drilling and Production Co. P. O. Box 98, Cherryvale, Kansas or call, LUther 7-7492. Tulsa, Oklahoma.

DRILLING DEAL wanted, share basis, or will sell one-half interest. Large lease acreage; Williston Basin, South Dakota. Excellent oil and gas subsurface geological reports. E. E. Erdman, Postoffice Box 424; Trenton, Nebraska.

FOR SALE: Marion County, Kansas, Mississippian production 2,400'. Kansas's most active drilling county. Area field pool producing 20 years. Will discuss propositions. Call or write: John W. Gehrke, Herington, Kansas. Phone 990 J 2.

AN INDIVIDUAL wishes to buy settled Clinton Sand oil or gas production in Ohio. Send complete logs, equipment inventory, production figures and price to: Box M-134, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Proven 25 acres offset to water flood. 750 ft. Bartlesville Sand. $400.00 per ⅛ test 1st well. Own rig and tools. Eastern Kansas. Well ready to start. Box M-137, The Oil and Gas Journal, Tulsa, Oklahoma.

Proven locations to drill; tremendous intrastate market; thirty producing days a month; substantial reserves, practically up against the market; numerous interlacing pipelines, that will take production for petrochemical plants nearby. Principals, financially able to drill, will only be considered.

Box M-136, The Oil and Gas Journal
Tulsa, Oklahoma

NOTICE—SALE OF OIL AND GAS MINING LEASES TRIBAL AND ALLOTED INDIAN LANDS

Department of the Interior Bureau of Indian Affairs Consolidated Ute Indian Agency
Ignacio, Colorado

SEALED BIDS will be received until 2:00 P.M. Mountain Standard Time, November 15, 1960, and opened at that time in the Office of the Superintendent Consolidated Ute Indian Agency, Ignacio, Colorado, for the leasing of 17,423.96 acres of Tribal land and 1,518.63 acres of allotted Indian land, located in Township 33 N., Ranges 3 and 4W., N.M.P.M., Archuleta County, Colorado, Township 34N., Range 7W., N.M.P.M., La Plata County, Colorado, Township 32N., Ranges 15 and 16 W., N.M.P.M., Montezuma County, Colorado, Township 35 S., Ranges 20 and 21 E., S.L.M., San Juan County, Utah, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Consolidated Ute Indian Agency, at Ingacio, Colorado.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. Notice is hereby given that approximately 8,605 acres of land in the Barksdale Air Force Base, Bossier Parish, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.S.T., November 16, 1960 when bids will be opened. Additional information concerning this lease offering, how and where to submit bids, copies of the lease agreement and bid forms may be obtained from the Director, Bureau of Land Management, U. S. Department of the Interior, Washington, D. C.; Outer Continental Shelf Office, Bureau of Land Management, 1001-A Maritime Building, 203 Carondelet Street, New Orleans, Louisiana; Branch of Oil and Gas Operations, Geological Survey, General Services Administration Building, Washington 25, D. C.; Oil and Gas Supervisor, Midcontinent Region, Geological Survey, 608 Midstates Building, 6 E. 5th Street, Tulsa 3, Oklahoma or the District Engineer, Geological Survey, 201 Barnes Building, 323 Market Street, Shreveport, Louisiana. Edward Woozley, Director.

ADVERTISERS
in this issue

Aldrich Pump Company, The 31
American Institute of Chemical Engineers 13
American Iron & Machine Works Company Subsidiary, American Machine & Foundry Company 158
American Machine & Foundry Company—
American Iron & Machine Works Co. 158
American Petroleum Institute 136
Anderson Company, The V. D. 157
Aquaness Department, Atlas Powder Company 37
Arcco Instrument Company, Inc. 146
Armco Drainage & Metal Products 11

Baker Oil Tools, Inc. 54
Baroid Division, National Lead Co. 44, 45
Bethlehem Steel Company 106
Black, Sivalls & Bryson, Inc 152, 153
Bowen Itco, Inc. 47
British Petroleum Company Limited, The 105
Brown & Root, Inc. 74

Cardwell Mfg. Co., Inc. 28
Chain Belt Company 14
Cherokee Laboratories, Inc. 144
Chicago Bridge & Iron Company 22, 23
Christensen Diamond Products 32
Cities Service Oil Company 15
Classified Advertising 188, 189, 190
Continental-Emsco Company, a Division of the Youngstown Sheet and Tube Company 8, 9
Coors Porcelain Company 160

De Laval Steam Turbine Company 131
DeZurik Corporation 149
Dover Corporation—
The W. C. Norris Manufacturer Division 143, 176
Dow Industrial Service 122
Dowell ..... 159, Inside Back Cover
Dresser Manufacturing Division 148
Drilling Equipment Manufacturing Co. 46

Flese & Firstenberger Mfg., Inc. 147
First National Bank of Shreveport, The 140
Franks Division of Cabot Corporation 35
Fuller Manufacturing Company 36

Garrett Corporation, AiResearch Industrial Division 27
Garrett Oil Tools, Division U. S. Industries, Inc. 150
Gates Rubber Co., The 161
Geolograph Oil Field Services 148
Geophysical Service, Inc. 162
Goodrich Chemical Company, B. F. (Hycar) 3
Goulds Pumps, Inc. 29
Gray Tool Company 177
Guiberson Corporation 42

Halliburton Company 6, 7, 71, 171
Hamer Valves, Inc. 137
Hughes Tool Co. ..... Back Cover
Hutchison Manufacturing Company 175
Hyatt Bearings Division, General Motors Corp. 1
Hycalog, Inc. 50

International Harvester 56, 57
ITT Kellogg, Division of International Telephone and Telegraph Corp. 133

Jones & Laughlin Supply Division 124, 125
Jones Company, The S. M. 5
Joy Manufacturing Company 26

Kaiser Refractories & Chemicals Division, Kaiser Aluminum & Chemical Sales, Inc. 138
Kelley Company, Ben F. 182

Lane-Wells Company ..... Inside Front Cover
Larkin Packer Company, Inc. 49
Liberty Mutual Insurance Company 11
Litwin Engineering Company 149

Macco Oil Tool Co. 145
Magnet Cove Barium Corp. 33
Marbon Chemical Division of Borg-Warner 16
Martin-Decker Corp. 140
McKissick Products Corporation 141
Mid-Continent Supply Company 24
Minneapolis-Honeywell Regulator Co., Industrial Division 38
Mission Mfg. Company 41
Mixing Equipment Co., Inc. 110
Mud Control Laboratories, Inc. 160

National Supply Company, Subsidiary of Armco Steel Corporation 17, 18, 19, 20
National Tank Company 192
Norris Manufacturer, W. C., Division of Dover Corporation 143, 176

Odex Engineering Company 182
Oil Center Tool Co. 4
Oil Well Supply Division 2
Otis Engineering Corporation 10, 52

Paris Distributor, Inc., Henry H. 48
Parkersburg Rig & Reel Co. 12
Petroleo Interamericano 174
Petroleum Electric Power Assn. 51
Plastic Applicators, Inc. 79
Porter Company, Inc., H. K.—
Forge and Fittings Division 134
Thermoid Division 43

Reda Pump Company 151
Reed Roller Bit Company 86, 87
Reynolds-French and Company 174
Reynolds Oil Field Sales Co. 142
Robbins & Myers, Inc. 39
Rockford Clutch Division of Borg-Warner Company 128
Rollway Bearing Company, Inc. 114

Sauder Tank Co. Inc. 160
Security Engineering Division, One of the Dresser Industries 21
Sheffield Steel Division, Armco Steel Corporation 109
Skinner Brothers Company 88
Southwestern Portland Cement Company 155
Square D Company 25
Sumitomo Metals Industries, Ltd. 113

Taylor Instrument Companies 129
Thomas Flexible Coupling Co. 132
Thompson Pump Company 140
Thompson Tool Co. 156

United States Steel Corporation—Oil Well Supply Division 2

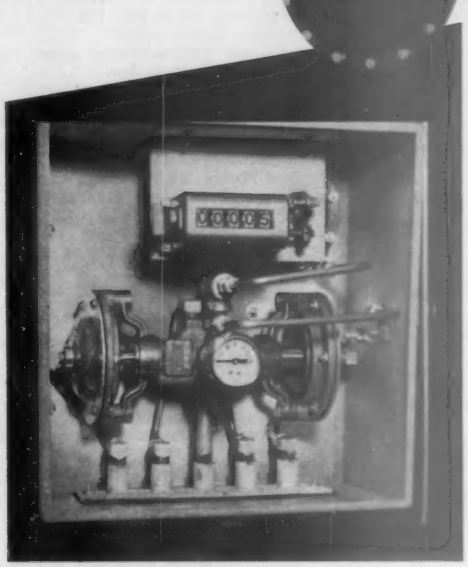
Valley Electric Corp. 157

Wagner Electric Corporation 173
Warner Lewis Company 58
Well Equipment Mfg. Corp. 137
Wheland Company, The 34
Wichita Clutch Company, Inc. 85
Worthington Corporation 135, 166, 167
Wyandotte Chemicals—Michigan Alkali Division 30

X-4 Corporation 121

National® LIQUA-METER*

Featuring National's New 3-Way Valve . . .



Tamper-proof, weather-proof control box with counter and rugged oil field controls.

1 bbl. capacity Liqua-Meter

For measuring liquid produced from individual wells or individual zones under a common royalty, the Liqua-Meter is recommended. Used in conjunction with a test separator or treater, the Liqua-Meter is used to determine the production of individual wells or zones without interrupting the production of other wells which continue to flow through the production separator. A counter records the number of dumps of the meter and is readily convertible to barrels run during the test.

Standard sizes are ½, 1 and 2 bbl. per dump. Other sizes on special order. Standard units available with two types of controls: Type "A" has one float, snap-acting pilot, manway and three-way valve. Type "B", shown, has two level controls, power booster relay, no manway, three-way valve, and meter control assembly and counter in tamper and weather-proof box.

Accurate within the limits prescribed by producer, royalty owner and regulatory body for measuring oil to be commingled.

A PLUS Value with all National Products . . . Engineers and field crews available from over 50 service and warehouse stocking points for complete units or spare parts to size, install and service National Liqua-Meters.

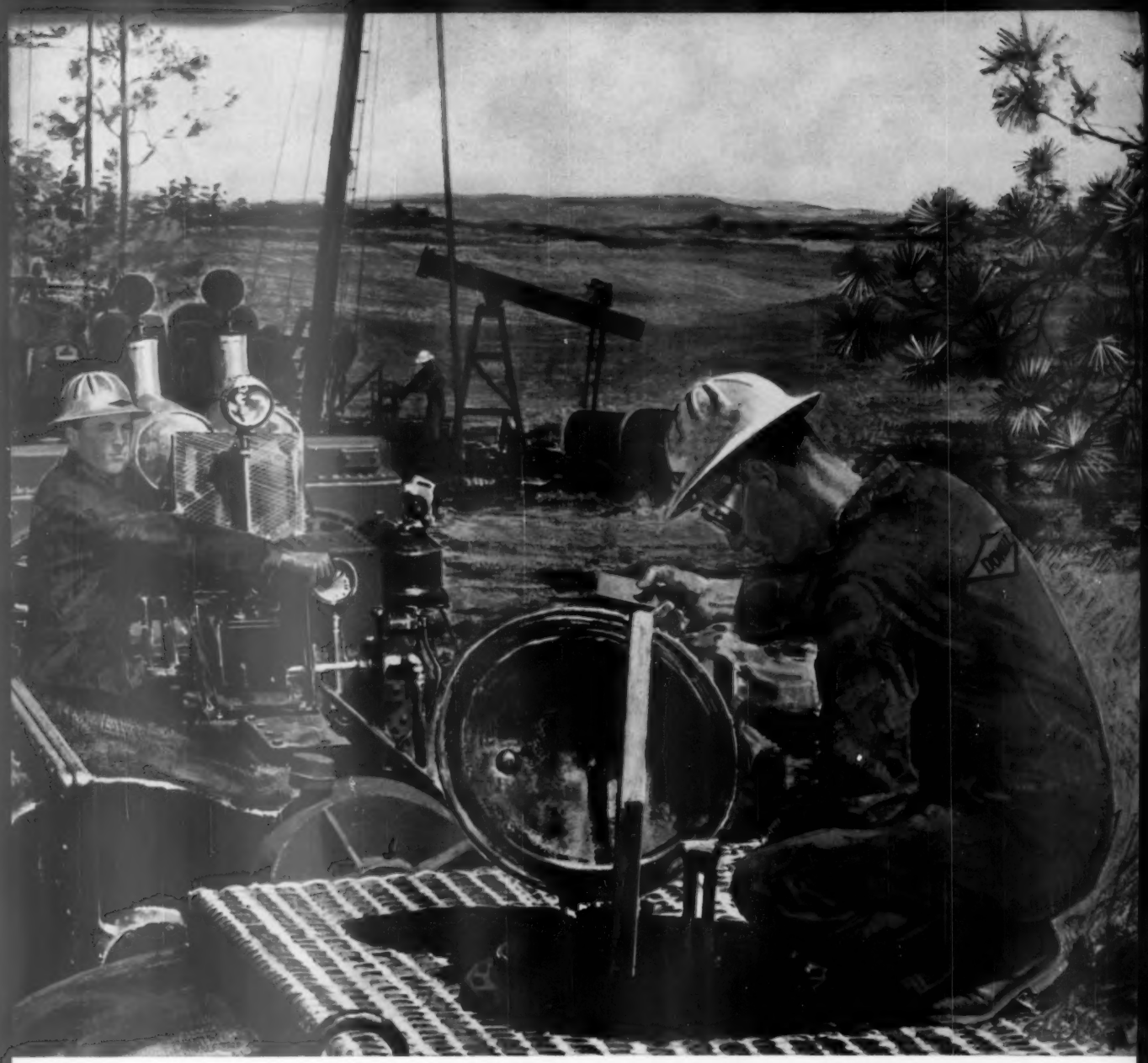
Trademark of National Tank Company

It's a National®

NATIONAL TANK COMPANY

DRAWER 1710

TULSA, OKLAHOMA



WHAT CAN BE NEW IN ACIDIZING AFTER 28 YEARS?

Answer: practically everything. Since 1932 when Dowell introduced inhibited acidizing, continuous improvements have been made in this method of well stimulation. For example, acidizing was originally used to improve the producing characteristics of only highly soluble formations like limestone or dolomite. This is no longer a limitation. Conglomerates, chats and even some sandstones are frequently helped with Dowell acidizing. From the simple method of "dumping" inhibited hydrochloric acid, Dowell has developed a host of effective new techniques, special acids and special chemicals. Just recently, Dowell introduced an even more precise method for *engineering* acid treatments called the "Acid Guide"*. Today you, as an operator, have the added assurance that this old service is younger than ever . . . more effective . . . streamlined to meet your needs and help you get more oil. What's new in acidizing? Plenty, and you can count on Dowell to continue developing even better methods. Get more for your money. *Dial Dowell.* Dowell, Tulsa 1, Oklahoma.

*DOWELL SERVICE MARK

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

COST *conscious...?*

If you are watching costs more closely than ever before . . . you're not alone. The oil patch is turning to old-fashioned frugality in seeking ways to cut drilling costs.

That's why so many users of Hughes bits, among the contractors and oil companies, are setting up *cost-saving* engineered bit programs with the help of their local Hughes representatives.

These programs are aimed at saving drilling time and bit costs by getting the most out of every bit run, and by making the maximum effective use of the equipment the operator has on hand.

So, if you are interested in keeping hole costs down, you'll find the best place to start is with high-performance Hughes bits and Hughes service.

HUGHES TOOL COMPANY ORIGINATOR AND

WORLD'S LEADING DEVELOPER OF CONE-TYPE ROCK BITS